Request for Section 18 emergency use of Endigo® ZCX insecticide to control the palestriped flea beetle (*Systena blanda*) in guayule fields in the state of Arizona

(a)General information required in an application for a specific exemption.

Type of Exemption - Arizona Section 18; Specific Exemption Request; April 1, 2023
This is an application for a specific exemption to authorize the use of Endigo® ZCX insecticide EPA Reg. No. 100-1458) to control palestriped flea beetle in guayule. The following information is submitted in the format indicated in the proposed rules for Chapter 1, Title 40 CFR, Part 166.

SECTION 166.20(a) 1: IDENTITY OF CONTACT PERSONS

i. The following is the contact person responsible for the administration of the emergency exemption:

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ii. The following qualified experts are also available to answer questions :

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SECTION 166.20(a) 2: DESCRIPTION OF PESTICIDE REQUESTED

Trade Name: Endigo® ZCX
Active Ingredient: thiamethoxam (19.2%) and lambda-cyhalothrin (9.59%)
Formulation: Aqueous formulation with1.8 pounds thiamethoxam and 0.9 pounds lambda-cyhalothrin per gallon
Manufacturer: Syngenta Company
EPA Reg. No.: 100-1458
Federal Label: See Attachments for copy of the federal label
Proposed Use Directions: See Attachments for a copy of draft Section 18 label

SECTION 166.20(a) 3: DESCRIPTION OF PROPOSED USE

i. Sites to be treated:

The insecticide will be restricted to use on guayule fields within the state of Arizona for the purpose of controlling the palestriped flea beetle, *Systena blanda,* when populations are threatening the integrity of the plant stand.

Locations within the state: Pima, Pinal, Maricopa, La Paz, and Yuma Counties

ii. Method of Application:

Foliar applications will be made by air, ground, or chemigation according to appropriate limitations of the Section 3 label.

iii. Rate of Application:

4.5 – 6 fl oz product / A (0.095 – 0.1266 lb ai / A).
Use will not exceed 0.2532 lb ai / A or 12 fl oz product per year.

iv. Maximum Number of Applications:

Maximum of two applications per year.

v. Total Acreage to be Treated:

300 acres.

Guayule is currently grown on less than 1,000 acres in Arizona. However, Bridgestone Americas is currently contracting new acres to be planted in 2023. Some will be planted in the spring (April–May); some will be planted in the fall (September–October). Over the next 5 years, guayule acreage is expected to increase to 25,000 acres as part of a USDA-funded effort to increase climate-smart practices through the cultivation of guayule as a climate-smart alternative to broad-acre crops like corn, cotton, alfalfa, and small grains. The Section 18 use pattern is needed on those acres subject to overwhelming flea beetle pressures, the urgent and non-routine, emergency condition when immigrating populations of flea beetles overwhelm current control measures. We estimate that this might impact as much as 50% of newly planted acres each year, but need to be prepared to spray all acres if current control measures fail or are overwhelmed by excessive flea beetle pressure. For 2023, we expect 300 acres to be newly planted during the spring and fall planting seasons.

vi. Total Amount of Pesticide to be used:

76 lbs ai.

Palestriped flea beetles, *Systena blanda*, infestations are likely to cause stand losses on a portion of all Arizona guayule acres (50–100%) if not controlled with Endigo ZCX. Up to two applications of Endigo ZCX may be required to control this pest. The label seasonal restriction will be no more than 12 fl oz of product used per acre, even though some crops on the federal Section 3 label permit up to 18 fl oz per year (e.g., pome fruit). Maximum amount of formulated product would be 12 fl oz. * 300 acres = 3,600 fl oz or 28.125 gallons of product, equivalent to about 76 lbs ai for the state of Arizona.

vii. Applicable Restrictions, Qualifications of Applicators, and Requirements:

Refer to the Endigo ZCX container label for first aid, precautionary statements, directions for use and conditions of sale and warranty information. It is a violation of federal law to use this product in a manner that is inconsistent with all applicable label directions, restrictions and precautions found on the container label and this supplemental label. Both

the container label and the supplemental Section 18 exemption label must be in the possession of the user at the time of application.

Applicable restrictions and requirements concerning the proposed use and the qualifications of applicators using Endigo ZCX are as follows:

- Pre-harvest Interval: The current federal label for Endigo ZCX imposes PHIs as long as 40 d for tobacco and as short as 1 d for head and stem brassica and cucurbits. As guayule has no food or feed uses, there is no specific residue concerns for harvested product, which is machine harvested, and baled and processed mechanically at a processing plant. Furthermore, the use pattern will be most likely within the first 60 d of planting in this perennial crop. The earliest first harvest would be at least 18 months after planting or about 16 months after the last spray made. Because applications are timed for shortly after planting to support stand establishment, we propose a 12-month PHI, which isolates the use pattern to the most critical period of guayule establishment.
- Restricted Entry Interval: 24 h
- Minimum Treatment Interval: Do not make applications less than 5 d apart.
- Do not make more than two applications per acre per year.
- Do not apply more than a total of 12 fl oz. of Endigo (0.2532 lb AI) per acre per year.
- Bees and other pollinators should not be foraging in guayule fields during the period when Endigo ZCX is needed to support stand establishment. At the earliest, time to initiation of first bloom on 50% of guayule plants in the field is >80 d after planting. All sprays should be made well within the first 60 d of plant development, most likely in the first 7–21 d post-planting. Nevertheless, the label must include a pollinator advisory statement including but not limited to the following:
    - Prior to use of Endigo ZCX, growers and the beekeepers hosted on their farm are advised to review the Arizona Management Plan for the Protection of Pollinators at:

  https://agriculture.az.gov/sites/default/files/AZ%20MP3%20Edited.pdf
- Before Endigo ZCX can be used, palestriped flea beetle densities must be larger than existing measures can control and stand loss is imminent if foliar sprays are not made. Pest managers should also review any relevant University of Arizona Cooperative Extension

management guidelines, which will be updated once this Section 18 is approved for use.

Arizona requires that anyone wanting to use a product under a Section 18 label apply with the Arizona Department of Agriculture (AzDA) to provide information on how many acres and where the product will be used. Upon application, AzDA will then provide them with a copy of the label and a permit number. All applications of the product under the Section 18 must then also be reported to the AzDA within 4 days of the end of the week the application occurred on a form 1080.

Endigo ZCX is a restricted use pesticide. Applicators therefore do need to be licensed and certified. All guayule will be grown under contract with Bridgestone Americas, which has a planned expansion of the industry as part of a USDA-funded climate-smart grant to the University of Arizona and Bridgestone Americas. As part of this 5-year project, growers will also be required to report all inputs on their contracted guayule acreage to the project team, including all pesticide use records. Every grower and their consulting licensed pest control advisor will be trained on management practices to limit risk of palestriped flea beetle damage by a technical services team established under this USDA grant. Training and education will be led by Cooperative Extension personnel and will include on-site, in-field training, including how to use Endigo ZCX properly and safely in the guayule production system.

viii. Duration of the Proposed Use:

April 1, 2023 – March 31, 2024

ix. Earliest Possible Harvest Date:

September 1, 2024 (i.e., 18 months after the first plantings).

SECTION 166.20(a) 4: ALTERNATIVE METHODS OF CONTROL IN ARIZONA

Registered Alternative Pesticides

The seed treatment NipsIt INSIDE® (clothianidin) is the only insecticidal approach available to guayule growers. No other insecticide is registered for this crop and this seed treatment,

while effective, can be overwhelmed by flea beetles[1]. Under these conditions, a foliar spray is also needed to prevent economic stand loss. NipsIt was and continues to be registered as a Special Local Need (SLN) seed treatment in Arizona since 2018. Although this seed treatment insecticide is very effective, crop damage can still be severe when flea beetle pressure is very high. One grower reported 25 of 40 acres as being severely damaged, a total stand loss, by this flea beetle despite use of NipsIt treated seed. Foliar insecticides are needed to protect guayule seedlings for commercial production. Cultural control tactics alone have been insufficient to provide protection under conditions of high flea beetle pressures. Foliar insecticides are critically needed to support the commercial production of guayule in Arizona.

Bifenthrin and Acephate Mixtures

Acenthrin, a commercial pre-mix of bifenthrin and acephate, has been the other consistent insecticide product screened for guayule stand protection. Due to supply chain limitations at the time and discontinued marketing of this product since by UPL, Bifenture EC and Acephate97up, both products and components of Acenthrin sold by UPL were submitted for SLN use in early 2022[2]. Shortly thereafter, however, due to regulatory concerns, these SLNs were withdrawn by the state of Arizona. Bifenture was later re-instated[3]; however, this product alone does not sufficiently control flea beetles to overcome the emergency condition.

Alternative Control Practices

Research is ongoing to identify non-chemical practices to reduce risk of stand loss by flea beetles and other insects in guayule. However, no cultural, biological, or other control tactic has been sufficiently protective to remediate the urgent and non-routine emergency condition of overwhelming flea beetle pressure on new stands of guayule. Avoiding periods of the planting season when migrating flea beetles are present would be a very effective measure. However, we currently do not have a sampling, trapping, or other sentinel system for predicting when flea beetles are locally abundant. Diversionary, trap, and companion planting with more attractive crop like cotton is currently under development and may reduce flea beetle pressure and damage to the adjacent guayule crop. However, that system is not

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[1] Acenthrin, Acephate97up, and Bifenture each briefly had SLNs in the State of Arizona, but were withdrawn due to regulatory concerns. Bifenture has since been re-instated as an SLN available to guayule growers, but is ineffective by itself (i.e., without mixing with acephate) to overcome the emergency and non-routine condition we face when flea beetles overwhelm the system.

[2] Ellsworth, P.C., N. Pier. 2022. First Foliar Insecticide Special Local Needs Registrations for Palestriped Flea Beetle Control During Guayule Stand Establishment. IPM Short. University of Arizona, Arizona Pest Management Center. http://hdl.handle.net/10150/664237

[3] Ellsworth, P.C. & N. Pier. 2022. Palestriped Flea Beetle Control During Guayule Stand Establishment: Use the Right Special Local Needs Label! University of Arizona, Arizona Pest Management Center. http://hdl.handle.net/10150/666234

ready for commercial deployment and itself requires an effective foliar insecticide spray like Endigo ZCX to work[4].

Other Alternative Insecticides

A comprehensive review was undertaken on the availability of insecticides with either known or putative effects on beetle targets. This yielded 925 prospective products to consider, making use of one or more active ingredients from 114 different chemistries. These chemistries were researched in the literature, on product labels, and in dialogue with industry and academic experts. Some were biologicals with effects too slow or residuals too short to be effective in the intended use pattern. They were discarded from further consideration. Others are listed in a worldwide list of materials deemed too hazardous for general use by international governing bodies (see Jepson et al. 2019[5]). These materials were also eliminated from further consideration. Lastly, there are active ingredients with known negative ecotoxicological effects, which were discarded from further study.

The remaining 28 active ingredients were considered with most tested directly against the palestriped flea beetle in guayule trials. Only two products performed consistently well across a broad array of conditions in three years of testing, Endigo ZCX and Acenthrin. Bifenthrin, a pyrethroid component of Acenthrin, was screened alone and provided insufficient efficacy. Acephate, an organophosphate component of Acenthrin, did demonstrate some useful efficacy when used alone. However, superior and durable efficacy was accomplished only in the combination of these two active ingredients in Acenthrin (see Registered Alternative Pesticides section). Note, lambda cyhalothrin and thiamethoxam were each tested individually but do not perform as well as the premix of the two in Endigo ZCX.

The following insecticides were screened over the last four years with each inadequate to provide foliar control of flea beetles in guayule: Abamectin, Acephate97up, Azera, Bifenthrin, Celite, Centric, Crop White, Gowan Malathion 8, Imidan, Minecto Pro, Prokil Cryolite 96, Pylon, Radiant, Steward, Torac+Exponent, Venom, Warrior II.

SECTION 166.20(a) 5: EFFECTIVENESS OF PROPOSED USE

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[4] Ellsworth P.C. N. Pier, I. Bordini. 2020. Push-Pull-Control: Securing Guayule's Future. 7th Annual New Technologies Workshop for Field Crops. 125 participants. 0.4 AZ CEUs. https://acis.cals.arizona.edu/docs/default-source/agricultural-ipm-documents/presentations/2020/20guayulepush-pull-controlvf1-uplow.pdf

[5] Jepson, Paul C. and Murray, Katie and Bach, Oliver and Bonilla, Maria and Neumeister, Lars, A Global Guideline for Pesticide Selection to Reduce Risks, and Establish a Minimum Pesticides List (August 23, 2019). Available at SSRN: https://ssrn.com/abstract=3441822 or http://dx.doi.org/10.2139/ssrn.3441822

Efficacy of the proposed use can be demonstrated in the impact Endigo ZCX has on guayule plants, flea beetle populations, and palestriped flea beetle survival in field bioassays. Ellsworth and Pier have been screening insecticides in guayule for four years. Their results are summarized in a series of tables.

Table A5-1 summarizes the impact of Endigo ZCX on various plant parameters including percentage of plants damaged by palestriped flea beetles, number of surviving cotyledon leaves, number of true leaves produced at the end of stand establishment, and percentage of stand that produces large plants (i.e., not stunted by palestriped flea beetle feeding activity). Plant damage in some cases was rates on a 0–3 scale where 0 = undamaged and 3 = dead plant. On average, Endigo ZCX reduced flea beetle damage by 47% and by up to nearly 80% under certain conditions. These effects were present even where other control measures were in place including NipsIt-treated guayule seed and where cotton was planted as a companion crop.

Table A5-1. Summary of Endigo ZCX effects on various plant parameters, Ellsworth & Pier, unpubl. data.

Context	Endigo	UTC	Change	P > F	Trial	Variable
22DAP	28.2	47.3	40.3%	0.006	19F4P1	% Damage
22DAP Cotton	30.5	49.3	38.1%	0.005	19F4P1	% Damage
22DAP No Cotton	26.0	45.2	42.6%	0.005	19F4P1	% Damage
Trt	13.7	21.7	36.7%	0.03	19F4P1	% Large plants
24h NipsIt	0.69	0.94	26.7%	0.070	19F4P2Trial2	Plant damage (0–3) assays
24h No NipsIt	1.06	1.69	37.0%	0.070	19F4P2Trial2	Plant damage (0–3) assays
Nipsit, Cotton	0.88	1.80	51.1%	0.0001	20F2G Early Plant, 1st	Plant damage (0–3) plots
Nipsit, No Cotton	0.45	1.30	65.5%	0.0001	20F2G Early Plant, 1st	Plant damage (0–3) plots
No Nipsit, Cotton	0.75	2.42	69.2%	0.0001	20F2G Early Plant, 1st	Plant damage (0–3) plots
No Nipsit, No Cotton	1.32	2.76	52.3%	0.0001	20F2G Early Plant, 1st	Plant damage (0–3) plots
Nipsit, Cotton	0.70	1.10	36.5%	0.045	20F2G Early Plant, 2nd	Plant damage (0–3) plots
Nipsit, No Cotton	0.98	1.73	43.3%	0.045	20F2G Early Plant, 2nd	Plant damage (0–3) plots
No Nipsit, Cotton	0.73	1.80	59.7%	0.045	20F2G Early Plant, 2nd	Plant damage (0–3) plots
No Nipsit, No Cotton	1.21	2.55	52.4%	0.045	20F2G Early Plant, 2nd	Plant damage (0–3) plots
NipsIt	2.29	1.83	20.2%	0.0002	20F2G Early Plant, 1st	No. of true leaves, 28DAP
No NipsIt	1.99	0.40	79.9%	0.0002	20F2G Early Plant, 1st	No. of true leaves, 28DAP
NipsIt	2.13	1.91	10.1%	0.003	20F2G Early Plant, 2nd	No. of true leaves, 28DAP
No NipsIt	2.21	0.91	58.7%	0.003	20F2G Early Plant, 2nd	No. of true leaves, 28DAP
Trt	1.27	0.41	67.9%	0.0001	20F2G Early Plant, 1st	No. cotyledon leaves, 28DAP
Trt	1.21	0.62	48.3%	0.0001	20F2G Early Plant, 2nd	No. cotyledon leaves, 28DAP
Trt	0.85	1.73	51.0%	0.0001	20F2G Early Planting	Plant damage (0–3) plots
Average loss in UTC relative to Endigo ZCX			**47.0%**			

Table A5-2 summarizes the impact of Endigo ZCX on palestriped flea beetle incidence / populations in experimental plots compared to where Endigo ZCX was not used. Endigo reduced in-field populations on average by 87.9% and by up to a maximum of 100%. Effects were large even when other control factors were in use like NipsIt-treated guayule seed and companion cotton.

Table A5-2. Summary of impact of Endigo ZCX on palestriped flea beetles, Ellsworth & Pier, unpubl. data.

Context	Endigo	UTC	Change	P > F	Trial	Variable
Trt	0.004	0.026	85.6%	0.002	19F4P1	Flea beetles per plant
10DAP NipsIt	0.003	0.027	87.1%	0.011	19F4P1	Flea beetles per plant
10DAP No NipsIt	0.009	0.054	83.1%	0.011	19F4P1	Flea beetles per plant
15DAP NipsIt	0.000	0.007	100.0%	0.011	19F4P1	Flea beetles per plant
15DAP No NipsIt	0.002	0.017	85.6%	0.011	19F4P1	Flea beetles per plant
10DAP Cotton	0.0127	0.081	84.4%	0.014	19F4P1	Flea beetles per plant
15DAP Cotton	0.0024	0.023	89.6%	0.014	19F4P1	Flea beetles per plant
Average loss in UTC relative to Endigo ZCX			**87.9%**			

Table A5-3 summarizes the results of in-field bioassays on guayule seedlings that had been previously sprayed with Endigo ZCX in comparison to an un-sprayed check. Endigo ZCX significantly reduced palestriped flea beetle survival by 55.2% on average. This was under a variety of conditions of field sprayed and degraded field residues. In one assay performed 5 days after Endigo was sprayed, all the beetles were dead after 24 hours of exposure.

Table A5-3. Summary of performance of Endigo ZCX in field bioassays, Ellsworth & Pier, unpubl. data.

Context	Endigo	UTC	Change	P > F	Trial	Variable
Trt	62.5%	81.3%	23.1%	0.034	19F4P2Trial2	Beetle survival at 24HAT
No Nipsit	37.5%	81.3%	53.8%	0.037	19F4P2Trial2	Beetle survival at 24HAT
Trt	43.8%	78.1%	44.0%	0.006	19F4P2Trial2	Beetle suvival at 102HAT
Trt	0.1%	73.4%	99.9%	0.0001	20F2G Early Planting	Beetle suvival at 5DAT
Average loss in UTC relative to Endigo ZCX			**55.2%**			

In summary, Endigo ZCX use for the control of palestriped flea beetles is well demonstrated by all available data collected from replicated studies of guayule in Arizona. Endigo ZCX led most trials for most parameters measured over multiple years of study. In some cases and under specific conditions, Acenthrin, a premix of bifenthrin plus acephate, performed numerically, but never statistically, better than Endigo ZCX. Imidan and Pylon have also shown efficacies, albeit less consistent, and statistical improvements over the UTC, but never

superior to Endigo ZCX. Endigo ZCX was also protective of stands preventing average losses of about one third (See Table B4-1) of the plant population.

SECTION 166.20(a) 6: EXPECTED RESIDUE LEVELS IN FOOD

There are no food or feed uses for guayule. Therefore, no residues will be in any food.

SECTION 166.20(a) 7: DISCUSSION OF RISK INFORMATION

No significant risks are expected with the issuance of this specific exemption. See attachments noted below.

Endigo ZCX is a broad-spectrum insecticide that is used to control a variety of insect pests on crops. It is a mixture of two active ingredients: thiamethoxam, which belongs to the neonicotinoid class of insecticides, and lambda-cyhalothrin, which is a pyrethroid insecticide. Endigo ZCX is primarily used on crops such as cotton, corn, soybeans, and wheat to control a range of pests including aphids, beetles, caterpillars, stink bugs, and thrips. It is also labeled for use on some vegetable and fruit crops. This combination of two different modes of action makes Endigo ZCX an effective tool for controlling a wide range of insect pests.

Endigo ZCX is a restricted use pesticide, meaning that it can only be applied by certified applicators or persons under their direct supervision. The product label provides specific instructions for use, application rates, and other important information to ensure its safe and effective use.

Detailed risk assessments have been done by the US-EPA when establishing the full Section 3 label. Related information is provided in a series of attachments:

1. Thiamethoxam. Human Health Assessment Scoping Document in Support of Registration Review, 12/16/2011, ThiamethoxamHumanHealthRiskAssessment_EPA-HQ-OPP-2011-0581-0005.pdf
2. Thiamethoxam. Acute and Chronic Aggregate Dietary (Food and Drinking Water) Exposure and Risk Assessments for Registration Review, 8/31/2017, ThiamethoxamDietaryExpoure_EPA-HQ-OPP-2011-0581-0097.pdf
3. Thiamethoxam – Transmittal of the Preliminary Aquatic and Non-Pollinator Terrestrial Risk Assessment to Support Registration Review, 11/29/2017, ThiamethoxamEcoEnvFate_EPA-HQ-OPP-2011-0581-0093.pdf
4. Lambda- & Gamma-Cyhalothrin: Human Health Draft Risk Assessment for Registration Review, 6/30/2017, LambdaHumanHealth_EPA-HQ-OPP-2010-0480-0299.pdf
5. Preliminary Comparative Environmental Fate and Ecological Risk Assessment for th eRegistration Review of Eight Synthetic Pyrethroids and the Pyrethrins, 9/30/2016, LambdaEco&Env_EPA-HQ-OPP-2010-0480-0022 - Preliminary Ecological Risk Assessment.pdf

SECTION 166.20(a) 8: COORDINATION WITH OTHER AGENCIES IN ARIZONA

The Arizona Department of Game and Fish will receive a copy of this request. Any comments received will be forwarded to the U.S. EPA.

SECTION 166.20(a) 9: NOTIFICATION/SUPPORT OF REGISTRANT

A letter of support and copy of the proposed Section 18 labeling is attached with this request.

SECTION 166.20(a) 10: ENFORCEMENT PROGRAM IN ARIZONA

The Arizona Department of Agriculture (AzDA) has adequate authority for enforcing provisions of Section 18 emergency exemptions. AzDA will require Syngenta to prepare Section 18 labeling that complies with AzDA and EPA requirements for this emergency use, if approved, to ensure that product distributed for the exemption is properly labeled. Also, please refer to requirements provided in SECTION 166.20(a) 3vii.

SECTION 166.20(a) 11: REPEAT USES

This is the first time Arizona Department of Agriculture has applied for this specific exemption.

SECTION 166.20(b) 1: NAME OF THE PEST

Systena blanda Melsheimer, palestriped flea beetle

The pale-striped flea beetle is a small beetle species that feeds on the leaves of various plants, including guayule (*Parthenium argentatum*). Broadly distributed throughout the U.S., the beetle is found in the southwestern United States and northern Mexico and has been identified as a potential pest of guayule cultivation. It feeds on the leaves of guayule, causing damage that can reduce the plant's growth and yield. The beetles feed on leaves, leaving small, irregularly shaped holes in the leaf tissue. In severe infestations, the damage can result in complete stand loss, defoliation and/or reduced plant vigor. Because guayule is a new crop, there is currently limited information on pest control measures.

SECTION 166.20(b) 2: DISCUSSION OF EVENTS OR CIRCUMSTANCES WHICH BROUGHT ABOUT THE EMERGENCY SITUATION

Guayule (*Parthenium argentatum*) is a shrub native to the Chihuahuan Desert that produces a natural rubber that is comparable in quality to the rubber produced from the *Hevea brasiliensis* tree. As a result, guayule has been identified as a new commercial crop that could provide a domestic source of natural rubber for the United States.

Guayule has several advantages over Hevea rubber. It is resistant to many of the pests and diseases that affect rubber trees, and it can be grown in semi-arid regions where water is limited, including Arizona. The plant also produces hypoallergenic latex, making it a safer alternative for people with latex allergies.

Furthermore, guayule has recently been identified as a climate-smart alternative to the broad-acre crop production in Arizona. The USDA Climate Smart program is providing a $35M grant to the University of Arizona to investigate guayule's climate-smart and other environmental co-benefits and stimulate uptake by water-strapped central Arizona growers. In collaboration with Bridgestone Americas, the University of Arizona will be providing grower incentives, drip irrigation technologies, and technical assistance for the production of guayule. The benefits are many:

1. Drought-tolerant: Guayule is a drought-tolerant crop, meaning it requires less water than many other crops. This is especially important in the arid climate of Arizona, where water resources are limited.
2. Carbon sequestration: Guayule has been found to have a high potential for carbon sequestration in the soil, which can help mitigate climate change by reducing the amount of carbon dioxide in the atmosphere.
3. Renewable resource: Guayule is a renewable resource, meaning it can be grown and harvested repeatedly without depleting the soil or damaging the environment.
4. Reduced use of synthetic rubber: Guayule can be used as a source of natural rubber, which can help reduce the need for synthetic rubber production. Synthetic rubber production is energy-intensive and can have negative environmental impacts.
5. Reduced transportation emissions: Guayule can be grown and processed locally in Arizona, reducing the need for long-distance transportation and associated greenhouse gas emissions.
6. Biodiversity: Once established, guayule's robust and perennial stands generally will not require soil tillage or insecticide use over the course of its eight years of production, producing conditions favorable to biodiversity. As a prolific flowerer, guayule supports dozens of species of pollinators and predators key to sourcing these ecosystem services regionally to multiple crop systems.
7. Ecodiversity: Past research has found guayule to be an insensitive sink for cotton's most yield limiting pest, *Lygus hesperus*. This means guayule production is compatible with the

existing production system and can lessen pest pressures on nearby crops. Cotton planted within 1km of guayule has been shown to harbor fewer Lygus bugs.

Overall, growing guayule in Arizona offers a promising opportunity for sustainable agriculture and climate smart practices, especially in light of the region's arid climate and limited water resources. By reducing water use, sequestering carbon, and offering a renewable source of natural rubber, guayule has the potential to play a role in mitigating climate change and promoting sustainable agriculture in the region.

Research on guayule cultivation in Arizona has been ongoing since the 1980s. The University of Arizona has been a leader in developing guayule cultivars that are adapted to Arizona's climate and can be grown on a commercial scale. Several companies, including Bridgestone Americas, have also established operations in Arizona to develop guayule-based products. Arizona's warm and dry climate, along with its abundant sunshine and ample land, makes it an ideal location for guayule cultivation. However, the success of guayule as a commercial crop in Arizona will depend on several factors, including the availability of water, access to markets for guayule-based products, and the economic viability of guayule cultivation compared to other crops.

Overall, guayule has the potential to become an important new crop in Arizona and the United States, providing a domestic source of natural rubber and creating new economic opportunities for farmers and businesses.

To reduce cost associated with transplanting, direct-seeding needs to be used in the commercial production of guayule, a new desert-adapted drought-resistant crop in development for Arizona. However, insect damage especially by the palestriped flea beetle, *Systena blanda,* is so severe to small seedlings that it becomes a major barrier for direct-seeded guayule. Furthermore, the resulting losses due to weed competition and subsequent herbicide injury to guayule greatly increase the costs of this initial stand loss.

The palestriped flea beetle is one of the larger flea beetles in North America. Its body size is several times larger than a cotyledon leaf of guayule. These beetles can be locally and seasonally abundant and favor germinating crops of all types. Their feeding on larger seeded crops often appears as a scarring or pitting of the cotyledons and is often of little economic consequence. However, in guayule, these beetles can consume entire cotyledons and stem of the plant.

An individual flea beetle can consume an entire guayule seedling in a matter of minutes. Protection of the cotyledons is paramount to successful establishment of guayule. Heavy flea beetle pressures can wipeout entire stands of guayule, causing 100% loss and the need and costs of replanting, as well as increased weed control and herbicide costs. Palestriped flea beetles can arrive in area fields in tremendous densities sourced from weeds, desert vegetation, and many other releasing crops.

Now that commercial contracts are being issued for the production of guayule in Arizona, there is a need for commercial control measures for palestriped flea beetles, especially during stand establishment. **The emergency condition we face is that there are no insecticides registered for foliar use on guayule that can adequately prevent unacceptable stand loss when faced with overwhelming immigrating populations of flea beetles.** Guayule seed treated with NipsIt Inside is a generally effective treatment for moderate to low levels of palestriped flea beetles. However, when new plantings are facing large immigrations of these beetles, the NipsIt treatment alone is insufficient to prevent stand losses of up to 40%.

Since guayule seedlings are very small and slow growing, weed competition is also a significant constraint on production. Herbicide use practices are very helpful in helping guayule establish and eventually shade out and finally out-compete and eventually exclude weed production. However, when flea beetles kill plants and diminish stands, large gaps in the guayule stand are created. These gaps become major sources of weed competition in the field and create even greater costs for the grower. Those gaps lead to irrigation water loss and other inefficiencies. Thus, even the initial 40% stand loss equates to economic losses far in excess of 40% of potential revenue due to the additional costs and losses to weeds, herbicide use, irrigation and fertility.

Therefore, we are requesting an emergency exemption for the use of Endigo ZCX based on the following: (1) Guayule is a newly developed crop currently undergoing expansion into commercial acreages for the first time; (2) There is only one insecticide registered for seed treatment, which is effective at providing protection against stand loss for up to moderate levels of pest pressure but unable to completely protect against stand loss in the face of large, immigrating populations of palestriped flea beetles; (3) Only one foliar insecticide is available, registered as an SLN, but it is inadequate to provide control as a foliar spray; (4) Under the current emergency conditions, guayule growers can suffer in excess of 40% economic loss, when heavy infestations of palestriped flea beetle cannot be adequately controlled with existing measures; (5) Failure to abate this emergency condition will result in a failure to capitalize on the many climate-smart and other environmental co-benefits of growing guayule in Arizona and the U.S.; and (5) Endigo ZCX provides excellent control of palestriped flea beetle under a wide range of conditions, helping us overcome this emergency condition and supporting the expansion and commercialization of this climate-smart, drought-resistant, desert adapted shrub in a water-strapped region of the U.S.

SECTION 166.20(b) 3: DISCUSSION OF ANTICIPATED RISKS TO ENDANGERED OR THREATENED SPECIES, BENEFICIAL ORGANISMS, OR THE ENVIRONMENT REMEDIED BY PROPOSED USE

It is not anticipated that there should be any risk to endangered or threatened species, beneficial organisms, or the environment if all applications are made in accordance to the Section 18 use directions. On the contrary, with this Section 18 in place, we should see larger and more successful uptake of guayule production in Arizona. After this critical first 60 d of growing guayule when stands are vulnerable, it is possible the crop will never be sprayed again with insecticides over the course of its 8 years of production. It is a perennial plant, harvested every other year. Once established, there may be minimum tillage required,

creating un-disturbed soil habitat where arthropods, small mammals, birds and other organisms can live and reproduce. It has flowers or is flowering for large segments of the year, providing abundant floral resources to arthropods. These arthropods include key generalist predators and pollinators that provide the ecosystem services of biological control and pollination needed by many nearby managed and natural systems.

Furthermore, we should emphasize that the proposed use pattern will be well within the existing footprint of cotton and other labeled crops for Endigo ZCX, resulting in no additional land or ESA habitat impacted. Guayule will be grown on acreage formerly used to plant the normal plant rotations typical of central Arizona including cotton, alfalfa, and small grains (usually wheat or barley).

SECTION 166.20(b) 4: DISCUSSION OF SIGNIFICANT ECONOMIC LOSS

Guayule commercialization in Arizona is just beginning but is poised to expand here in order to address the need for climate-smart and low water use alternatives in our cropping system. Bridgestone is investing >$100M to develop guayule in Arizona for domestic rubber production. A University of Arizona group has assembled a team of research, Extension, and industry scientists to commercialize climate-smart guayule in Arizona with the support of a $35M grant from USDA, which includes grower incentives for participating in guayule production.

Once established, this crop has many attributes that are favorable to the environment. We will not attempt to valuate them here. Instead we focus on the ostensibly sole economic insect pest, the palestriped flea beetle.

Economic analysis is relatively straightforward, because guayule is a biomass crop where a uniform, healthy stand of sufficient density is needed to produce the yield component. Palestriped flea beetles create an emergency condition when their feeding results in plant death and stand loss. Reductions in stand result proportionally in reductions in biomass yield. Proportional loss in biomass yield equates to proportional loss in gross revenue.

We can demonstrate that the difference between routine and emergency conditions result, on average, in 33.34% loss in guayule stand (Table B4-1). That loss in stand then results in an equivalent loss in revenue for our growers (Table B4-2). This 33.34% loss in gross revenue exceeds EPA's criterion for a Tier 1 loss of 20%. Based on published budgets for guayule production[6] and Bridgestone estimates of average yields of 23,400 lbs of biomass per acre

[6] T. Teegerstrom, C. Seavert, P. Gutierrez, H. Summer, E. Sproul, B. Evancho, P. Ollerton. "2023. Enterprise Budgets: Guayule, Flood Irrigated, Southern Arizona". University of Arizona Cooperative Extension Bulletin. 7 pages. Az2036, Feb.2023. https://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az2036-2023.pdf

(Wang, pers. comm.), we estimate that growers will lose over $624 per acre to palestriped flea beetle under the emergency conditions.

Table B4-2. Tier 1 analysis of Significant Economic Loss for the routine and emergency condition of this Section 18 application. Tier 1 losses are over 20%.

Item	Routine	Emergency	Comments	Tier
Harvested Yield (lbs guayule biomass / A)	23400	15598.44	Emergency based on average stand losses from Ellsworth & Pier 2019, 2020, unpubl. data. See Table B4-1.	
Value per lb of biomass ($USD)	0.08	0.08	Estimate from Teegerstrom et al. 2023.	
Gross Revenue (GR), biomass	$1,872.00	$ 1,247.88	**33.34%**	**Tier 1 is ≥ 20%**

Table B4-1. Summary of guayule stand losses under emergency conditions, Ellsworth & Pier, unpubl. data.

Context	Routine	Emergency	Change	P > F	Trial	Variable
Nipslt	40.488	33.369	17.6%	0.0001	19F4P1	Stand count *1000
No Nipslt	29.906	12.769	57.3%	0.0001	19F4P1	Stand count *1000
Cotton	38.888	23.556	39.4%	0.018	19F4P1	Stand count *1000
No Cotton	31.506	22.581	28.3%	0.018	19F4P1	Stand count *1000
Trt	35.197	23.069	34.5%	0.0001	19F4P1	Stand count *1000
25DAP Nipslt	55.375	48.375	12.6%	0.008	19F4P2Trial1	Stand count *1000
25DAP No Nipslt	25.000	5.083	79.7%	0.008	19F4P2Trial1	Stand count *1000
38DAP Nipslt	52.042	45.666	12.3%	0.008	19F4P2Trial1	Stand count *1000
38DAP No Nipslt	20.833	12.833	38.4%	0.008	19F4P2Trial1	Stand count *1000
25DAP Cotton	41.666	25.541	38.7%	0.0007	19F4P2Trial1	Stand count *1000
25DAP No Cotton	38.708	27.916	27.9%	0.0007	19F4P2Trial1	Stand count *1000
38DAP Cotton	34.417	26.791	22.2%	0.0007	19F4P2Trial1	Stand count *1000
38DAP No Cotton	38.458	21.708	43.6%	0.0007	19F4P2Trial1	Stand count *1000
25DAP Nipslt	44.625	34.750	22.1%	0.004	19F4P2Trial2	Stand count *1000
38DAP Nipslt	53.625	40.375	24.7%	0.004	19F4P2Trial2	Stand count *1000
47DAP Nipslt	55.875	46.625	16.6%	0.004	19F4P2Trial2	Stand count *1000
54DAP Nipslt	72.625	56.125	22.7%	0.004	19F4P2Trial2	Stand count *1000
Nipsit, Cotton	0.85	0.76	9.0%	0.0001	20F2G Early Plant, 1st	Stand survival (0–1)
Nipsit, No Cotton	0.90	0.81	8.8%	0.0001	20F2G Early Plant, 1st	Stand survival (0–1)
No Nipsit, Cotton	0.94	0.36	58.0%	0.0001	20F2G Early Plant, 1st	Stand survival (0–1)
No Nipsit, No Cotton	0.65	0.11	53.5%	0.0001	20F2G Early Plant, 1st	Stand survival (0–1)
Nipsit, Cotton	0.94	0.89	5.0%	0.0098	20F2G Early Plant, 2nd	Stand survival (0–1)
Nipsit, No Cotton	0.90	0.57	32.8%	0.0098	20F2G Early Plant, 2nd	Stand survival (0–1)
No Nipsit, Cotton	0.93	0.62	30.6%	0.0098	20F2G Early Plant, 2nd	Stand survival (0–1)
No Nipsit, No Cotton	0.74	0.33	41.3%	0.0098	20F2G Early Plant, 2nd	Stand survival (0–1)
Nipslt	35.875	35.062	2.3%	0.0001	20F2G Early Planting	Stand count *1000
No Nipslt	28.667	11.312	60.5%	0.0001	20F2G Early Planting	Stand count *1000
Cotton	33.708	25.979	22.9%	0.0001	20F2G Early Planting	Stand count *1000
No Cotton	31.333	20.395	34.9%	0.0001	20F2G Early Planting	Stand count *1000
Trt	22%	-52%	73.6%	0.0001	20F2G Early Planting	Ave stand change (%)
Nipslt	-1%	-16%	14.8%	0.004	20F2G Early Planting	Weekly stand %change
No Nipslt	-1%	-47%	46.0%	0.004	20F2G Early Planting	Weekly stand %change
Trt	28.750	18.500	35.7%	0.0001	20F2G Early Planting	Final stand count, 42DAP
Trt	7.06%	-58%	65.4%	0.0001	20F2G Early Planting	% Change in final stand
Average loss in stand under emergency condition>			**33.34%**			

Attachments

1. Thiamethoxam. Human Health Assessment Scoping Document in Support of Registration Review, 12/16/2011, ThiamethoxamHumanHealthRiskAssessment_EPA-HQ-OPP-2011-0581-0005.pdf
2. Thiamethoxam. Acute and Chronic Aggregate Dietary (Food and Drinking Water) Exposure and Risk Assessments for Registration Review, 8/31/2017, ThiamethoxamDietaryExpoure_EPA-HQ-OPP-2011-0581-0097.pdf
3. Thiamethoxam – Transmittal of the Preliminary Aquatic and Non-Pollinator Terrestrial Risk Assessment to Support Registration Review, 11/29/2017, ThiamethoxamEcoEnvFate_EPA-HQ-OPP-2011-0581-0093.pdf
4. Lambda- & Gamma-Cyhalothrin: Human Health Draft Risk Assessment for Registration Review, 6/30/2017, LambdaHumanHealth_EPA-HQ-OPP-2010-0480-0299.pdf
5. Preliminary Comparative Environmental Fate and Ecological Risk Assessment for th eRegistration Review of Eight Synthetic Pyrethroids and the Pyrethrins, 9/30/2016, LambdaEco&Env_EPA-HQ-OPP-2010-0480-0022 - Preliminary Ecological Risk Assessment.pdf
6. Registrant Letter (Syngenta)
7. Proposed Section 18 label
8. Federal Label for Endigo ZCX
9. Letter of support from University of Arizona technical expert