Good Agricultural Practices (GAPs) for the Management of Septoria Spot of Oranges in California

2025-26

Summary: Septoria spot is a fungal disease that occurs on leaves, twigs, and in rind injuries of fruit of several species of citrus. The disease has historically been considered a minor disease with <3% detections in grower lots in the most severe outbreaks. Research has indicated that:

- The pathogen cannot infect healthy tissue and needs injuries for infection.
- The disease requires a minimum of 3-4 weeks to develop under constant incubation temperatures (e.g., 20°C) and longer under fluctuating temperatures.
- Fruit on trees are free of the disease going into the harvest season (cold, rainy season).
- Cold injury is one of the most common injuries correlated with the incidence of disease.
- Cold injury of rind tissue has been reproduced experimentally.
- Severity of disease has been correlated with increases in precipitation after cold injury to fruit.
- A risk assessment model has been developed based on the accumulated exposure to temperatures less than 1°C and total precipitation after the first freeze event.
- The model has been implemented on a large-scale for many seasons to identify periods of high risk for infection and timing of fungicide applications.
- Efficacy data has been developed identifying effective new preharvest fungicide treatments. Both pre- and postharvest fungicides are currently registered for preventing and suppressing the disease on fruit.
- Chronological graphs indicate that most of the disease develops between Feb. and April (indicating a major time of infection between December and March). GPS data indicates that the distribution of the disease for the first seven harvest seasons of the NAVEK program is mainly between Kern Co. and Madera Co., with most detections in Tulare Co.
- A web-based database should be used for submitting samples by each of the participants in the program that is accessed by the NAVEK lab personnel to recognize incoming samples without errors associated with the manual re-entering information from submitted forms.
- Detection of Septoria is currently based on the use of a real-time PCR-based method using a portion of the beta-tubulin DNA sequence from *Septoria citri*.

I) Management of the disease: Removal of dead branches and twigs that harbor the pathogen and designing irrigation systems to minimize wetting of foliage are fundamental practices for managing the disease. Zinc-copper-lime (preferred), fixed copper-sticker treatments, or registered alternatives (e.g., Abound, Quadris Top, Priaxor, Luna Sensation, Ph-D, Oso) should be applied prior to winter rains and, if necessary, additional applications during the winter (e.g., January) and early spring (late Feb. or March) may need to be done. Zinc-copper-lime, fixed copper sticker, and other fungicide treatments are preventative or protective. Zinc-copper-lime has been part of management guidelines in California for over 70 years.

A) Fungicide Treatments:

1) The first field-application of the fungicide treatment of zinc-copper-lime or registered alternative is **highly recommended** for all oranges planned for exportation to Korea.

2) The treatment **should be applied <u>between October 15 and November 30</u>** for all California oranges (Navels and Valencias) shipped to Korea.

(a) Specifically, **the zinc-copper-lime treatment can be made as follows (see Supplemental Table A)**: When using zinc sulfate (neutral and acidic forms) and copper hydroxide, copper oxide, or basic copper sulfate (i.e., **fixed or basic coppers**):

i. The rate of metallic zinc equivalent (MZE) should be a minimum of 2.5 lbs MZE per acre. The rate of metallic copper equivalent (MCE) per acre should be a minimum of 1.65 lbs mce per acre. A minimum of 2 lbs hydrated lime should be added when using 1.65 lbs copper (MCE) and a minimum of 4 lbs hydrated lime when using 4 lbs copper (MCE) per acre. The material should be applied as a dilute application of no less than 400 gallons per acre. This treatment is preferred for Septoria spot and brown rot management. Lime improves copper persistence on the leaves and fruit, repels leaf hoppers and reduces rind oil spotting caused by their feeding, corrects mottle leaf or zinc deficiency problems, and reduces copper phytotoxicity.

ii. Higher rates of zinc, copper, and lime may be used as local conditions warrant or if higher disease levels were experienced last season. Field observations of Septoria spot symptoms on fruit or a positive detection of the disease based on the NAVEK report last season indicates potentially higher inoculum levels going into this growing season. Rates should not exceed manufacturer's labeled rates (*see* Supplemental Tables – Table A).

(b) **Bordeaux sprays** with the addition of zinc also meet the preharvest requirements for exporting oranges to Korea in accordance with UC guidelines. If zinc-copper Bordeaux applications are used, 3.3 lbs metallic zinc, 1.65-2.45 lbs metallic copper, and 20-67 lbs hydrated lime per acre in dilute application of no less than 400 gal/acre will meet the minimum requirement (*see* Suppl. Table B).

(c) The **mix order for preparing Bordeaux or zinc-copper-lime treatments: first add zinc, then copper, followed by lime**. Zinc or neutral copper formulations can be added to registered alternative fungicide treatments such as Quadris Top, Abound, Priaxor, Luna Sensation, Ph-D, and Oso (follow label guidelines).

(d) **Fixed copper + a sticker adjuvant can be used** but is not preferred because of the advantages of lime described above. If lime is not available, a fixed copper (e.g., cupric hydroxide, copper oxide) should be mixed with a sticker adjuvant (e.g., Cohere, NuFilm 17, etc.) or 0.5 to 1% agricultural oil (415 preferred or a 440 oil) to increase persistence. When using spray oils, trees may be prone to phytotoxicity that may occur especially on southern rows or southern end trees because of the combination of darkened foliage and sunburn. Also, note that zinc sulfate is acidic and may need to be buffered in the spray tank to prevent phytotoxicity. Consult a PCA if lime is not applied. A fixed copper and sticker can be mixed the alternatives listed below.

(e) **Adjusted spray requirements for young trees** (6 years old or less). If the orange and other citrus trees have been planted less than or equal to six years ago, the following modification to the copper spray may be applied. Using the zinc-copper-lime formulation and alternative fungicide instructions posted on the CCQC website, you may apply 200-400 gallons/acre to blocks of young trees (one to six years after planting). It is suggested that you turn off the nozzles that would have gone over the top of the young trees. Full tree coverage is, however, still required.

(f) The spray should cover the entire tree canopy. Skirt sprays are not acceptable. All active ingredients in the spray mix (i.e., zinc, copper, and lime, as well as the newer registered fungicides) are required to be reported to the county.

3) **Registered alternative fungicides** such as Quadris-Top® (azoxystrobin – FRAC Group 11 and difenoconazole – FRAC Group 3), **Abound**® (azoxystrobin), **Priaxor** (fluxapyroxad – FRAC Code 7 and pyraclostrobin - FRAC Code 11), **Luna Sensation** (fluopyram – FRAC Code 7 and trifloxystrobin – FRAC Code 11), **Cevya** (mefentrifluconazole - FRAC 3), **Ph-D/Oso** (polyoxin D – FRAC Code 19), and **Elysis** (mefentrifluconazole/ fluxapyroxad) are also highly effective and should be applied in volumes of 200-800 gal/acre in *November* (Table 1 and Suppl. Table A).

(a) These alternatives could be used in rotation or in mixtures with each other or with zinc-copper-lime or fixed copper + sticker adjuvant treatments for the first application or if additional applications of fungicides are needed later in the season (*see* Suppl. Table C). Applications volumes are suggested to provide sufficient coverage and may vary for citrus crop (tree size and canopy density). Suppl. Table C indicates 200-800 gal/A.

(b) Apply no more than two sequential applications of FRAC Groups 3, 7, or 11 and then rotate to fungicides with different modes of action.

(c) Do not apply in citrus plant propagation nurseries.

(d) MRLs have been established in many countries (including Korea), however, some countries do not have MRLs established for these fungicides. Please check with the export country before making pre-harvest fungicide treatment/application decisions.

(e) Additional materials may be needed for management of brown rot in addition to Septoria spot management.

Table. 1. Summary of available ***preharvest*** fungicides: (**MRLs** are in Section IV. Part 5)

No.	Fungicide*	Trade name	FRAC Code**	International MRLs	Rating***	
					Prevention	Anti-sporulation
1	Azoxystrobin	Abound	11	Yes	++	+++
2	Copper	Various	M1	Yes	+++	---
3	Polyoxin-D	Oso, Ph-D	19	No	+++	---
4	Azoxystrobin/ difenoconazole	Quadris Top	3/11	Many	+++	+++
5	Fluopyram/ trifloxystrobin	Luna Sensation	7/11	Some	+++	+++
6	Fluxapyroxad/ pyraclostrobin	Priaxor	7/12	Some	+++	+++
7	Mefentrifluconazole	Cevya	3	Some	+++	+++
8	Mefentrifluconazole /Fluxapyroxad	Elysis	3/7	Some	+++	+++

B) The Second and Third Fungicide Treatments and the <u>Revised NAVEK Protocol</u>

1) The second and third field-applications of the zinc-copper-lime treatments (additional tables similar to Suppl. Tables A, B, and C will be provided to the industry as the season progresses) or USDA-APHIS and EPA-approved efficacious alternatives (e.g., Abound, Quadris Top, Priaxor, Cevya, Elysis, Luna Sensation, Ph-D/Oso) will be recommended **if the model for Septoria spot indicates sufficient risk for disease in each of the three citrus growing districts (e.g., Central, Coastal, Desert) in California.**

   A revised NAVEK protocol has been developed and in operation for the last four seasons and will be used again for the 2025-26 export season. Growers and packers may apply fungicide treatments based on the same schedule as in previous years with an initial application before Nov. 30th and a second or third application based on the environmental monitoring model. Alternatively, they can use the revised NAVEK protocol that could minimize copper applications and maintain eligibility of positive lots.

2) **Revised NAVEK protocol**: If NAVEK samples submitted **after January 1** are:
   i. Negative for Septoria spot, then grower lots will be exempt from the second application. Re-submitted samples after 45 days if harvest is extended **(Suppl. Fig. 1)**.
   ii. If NAVEK samples are positive for Septoria spot, then the second application must be with an anti-sporulation fungicide (e.g., Luna Sensation, Priaxor, Quadris Top) alone or in a mixture with copper. The sample should be re-submitted after application and within one month before harvest to the NAVEK lab. The check box **"Re-submission after a previous positive"** on the electronic form should be checked **(Suppl. Fig. 2)**. Re-submitted samples will be evaluated for sporulation of the pathogen, and if there is no sporulation, the fruit lot should be shipped. If positive for sporulation, then the lot should be diverted to other markets.

3) Based on bullet 2i and 2ii above, if a second application is not done or the second application is done with an anti-sporulation fungicide, then it is strongly recommended that fruit are postharvest treated with the highest-rated anti-sporulation fungicide Graduate A+ to minimize sporulation of *S. citri* during transit.

4) ***The revision to NAVEK:***
   <u>*Advantages*</u>:
   - Increases scouting and orchard evaluations
   - Increases NAVEK participation with more samples as opposed to following forecasted fungicide applications

- Does not remove potential positive orchards from export unless sporulation is observed on fruit of second submission to lab
- Integrates use of copper in citrus disease control
- Provides the use of non-copper-fungicide alternatives
- Potentially decreases the total number of fungicide applications
- Less fungicide applications provides direct cost saving
- Integrates preharvest with postharvest decay and sporulation control

Disadvantages:
- Extra monitoring and submission of samples to NAVEK
- Fruit lots still can be banned for export to Korea for the season if sporulation occurs on NAVEK samples after the second application with an anti-sporulation fungicide

5) Growers and packers who do not want to follow this revised protocol to the NAVEK program and want to automatically apply copper or alternative fungicides following the Septoria forecast would also be complying with the Korean Protocol.

Advantages:
- Simple to manage

Disadvantages:
- Multiple applications of copper or alternative fungicides
- Positive samples cannot be exported to Korea for the season

6) **Timing of the second and third fungicide treatments will be based on the accumulation of temperatures below -1˚C and subsequent accumulation of precipitation (mm).** Categories 1 to 4 represent increasing risk for disease. Advisories will be made at category 1 (green) or 2 (yellow) based on actual or highly probable, forecasted weather conditions. The following is the risk assessment model (Table 2) that will be followed:

Table 2. Numerical risk model for forecasting Septoria spot.

Numerical Risk Model for forecasting Septoria Spot

	Precipitation (mm)				
Hrs with T< -1 C	31-60	61-90	91-120	121-150	151-180
<10	0	1	2	3	4
10-20	1	2	3	4	4
21-30	2	3	4	4	4
>30	3	4	4	4	4

7) **If favorable environmental conditions continue to occur,** the application of additional preventative treatments should be made within a reasonable period (approximately ***30-45*** days). Please monitor industry announcements by checking e-mail and visiting CCQC and CCM websites frequently in December, February, and March.

8) Environmental conditions will dictate the need for submitting voluntary samples of oranges for determination of Septoria spot in grower lots.

9) Additional applications may be recommended depending on the occurrence of favorable environmental conditions for disease development. Notifications to the industry will be made if conditions are conducive. Follow label and regulatory instructions for registered materials.

II) Pesticide Use Reports **should** be made available.

III) Evaluation and sampling guidelines:

A) All grower lots should be evaluated by field scouting, and suspect samples should be collected and submitted to the NAVEK lab (Kearney Research and Extension Center, 9240 S. Riverbend Ave, Parlier, CA 93648). Submitted samples of fruit must have symptoms.

1. Follow the guidelines for Categories I, II, III, and IV (refer to the Septoria Symptom Handout on CCQC's website at *www.citrusresearch.com*). Do not submit fruit with Category V or fruit that are symptom-less. Any lot found positive for Septoria spot in previous years should be evaluated and sampled rigorously (i.e., 2X sampling size of fruit for the first collection sample).

B) All samples must be submitted using the online form which includes GPS information, as well as helpful prompts and multiple choices that assist packinghouses in filling out and submitting the form correctly. Using this form reduces overall costs of the NAVEK program to the industry.

C) Evaluation and collection of fruit. **Fifty fruit on 20 trees in each grower lot** should be directly evaluated on the tree for Septoria spot **following symptom Categories I-IV.**
Fruit samples should also be taken as follows:

1. **For fruit shipments to Korea through Feb. 7th: Normal sampling practice**: Grower lot samples should consist of 20 fruit (as described in 1A above).
2. **For fruit shipments to Korea after Feb. 7th: Normal sampling practice**: Grower lot samples should consist of 30 fruit (as described in 1 A above).

E) Sample frequency, incubation duration, and longevity of test. Upon submission of the sample, fruit will be pre-screened for signs of the pathogen. Fruit tissue with symptoms will then be subjected to a molecular assay.

1. If Septoria spot is found in a grower lot, then the lot is considered ***positive*** and thus, fruit harvested from this grower lot ***should not*** be shipped to Korea.
2. If Septoria spot is not found in a grower lot, then the lot is considered ***negative*** and thus, fruit harvested from this grower lot can be shipped to Korea. Remember, it is suggested that re-sampling should be done within **45 days** from the date the report is issued from the incubation lab.
3. **It is highly recommended that shorter intervals be used (e.g., 35 days) for fruit sampled in Feb. and March if conducive conditions occur for disease development.**

F) Sampling method (trees and fruit to evaluate in the field) and design.

1. **Total number of trees to be evaluated per grower lot = 20**.
2. **Total number of fruit to be evaluated per tree = 50.**
3. Fruit numbers to collect (see above IC)
   a) Normal sample:
   Through Feb. 7: Total number of fruit to collect with symptoms = 20 (C1a) or ***1 fruit per tree***.
   b) After Feb. 7: Total number of fruit to collect with symptoms = 30 (C2a) or ***1 fruit for odd-numbered trees and 2 fruit for even-numbered trees***.
4. **Sampling design:**
   a) Count the total number of rows and divide by 4 (e.g., 100/4 = 25). Rows 25 and 75 will be sampled. For fractions, round up.
   b) Count the total number of trees/row and divide by 10 (e.g., 100/10 = 10). Thus, every 10^{th} tree will be sampled.
   c) **Summary**: A "U" shaped walking pattern can be done through the grove to bring the person sampling back to or near the starting point.

G) Limits on samples submitted to the incubation lab per week.
Sample allocations will be determined by CCQC and will be sent individually and confidentially to each packinghouse by e-mail.

IV) Postharvest Management Guidelines:

A) Fruit treatments - All fruit destined for Korea upon arrival in the packinghouse should have the following treatments:

1. **Wash with chlorinated water.**
   a) Free chlorine must be 100-200 ppm.
   b) Recommended pH of 7-8.
2. **Treat with postharvest fungicides.**
   a) TBZ and/or azoxystrobin-fludioxonil (Graduate A+) should be applied in an aqueous application prior to a fruit coating and/or in a fruit coating or wax. The fruit coating may also include either imazalil (e.g., Fungaflor, Deccocil, Freshgard, etc.), fludioxonil (e.g., Graduate), Graduate A+, or pyrimethanil (e.g., Penbotec). A pre-mixture of pyrimethanil-imazalil (e.g., Philabuster) ***should*** include TBZ or Graduate A+. Graduate A+ is the best anti-sporulation treatment (Table 3).
   b) TBZ rates: Aqueous (200 – 400 ppm) or in fruit coating (3500 – 5000 ppm).
   c) Anti-sporulation is an important aspect of any fungicide treatment because detection methods for positive identification of Septoria spot in Korea is based on the presence of spores in spore cases known as pycnidia.
3. **Fruit residues of greater than or equal to 1 ppm of each postharvest fungicide should be obtained.**
4. **Summary of *postharvest* fungicides for citrus:**

Table. 3. Postharvest fungicides available for citrus

Fungicide	Trade name	FRAC Code	International MRLs	Rating	
				Prevention	Anti-Sporulation
Imazalil	Various	3	Yes	NA	+
Fludioxonil	Graduate, FDL	12	Yes	NA	++
Azoxystrobin/ fludioxonil	Graduate A+	11/12	Many	NA	+++
Natamycin	BioSpectra	48	Pending	NA	---
Propiconazole	Mentor	3	Yes	NA	+++
Pyrimethanil	Penbotec	9	Yes	NA	---
Thiabendazole	Alumni/TBZ	1	Yes	NA	++

NA - Not applicable because infections already occurred in the orchard.

5. **Current MRLs of pre- and postharvest fungicides on sweet orange are shown in Table 4 (updated 09-25):**

TABLE 4.

Fungicide	Pre- / Post-harvest	Orange MRLs (ppm)						
		US	Codex	Korea	China	Hong Kong	Japan	Taiwan
Azoxystrobin	+/+	15	15	10	1	15	10	10
Difenoconazole	+/-	0.6	0.6	0.6	0.2	0.6	0.6	0.6
Mefentrifluconazole	+/-	0.6	1	1	---	---	0.6	0.6
Fluopyram	+/-	1	0.6	1	1	---	1	0.5
Fluxapyroxad	+/-	1	1.5	1	0.3	---	4	0.8
Fosetyl-Al	+/-	9	20	4	---	5	150	10
Pyraclostrobin	+/-	2	2	2	3	1	2	1
Trifloxystrobin	+/-	0.6	0.5	1.5	0.5	0.5	3	0.5
Mefenoxam	+/-	1	5	0.01	5	5	0.7	0.5
Fludioxonil	-/+	10	10	10	10	10	10	5
Imazalil	-/+	10	15	15	5	10	5	5
Natamycin	-/+	Ex.	---	---	---	---	---	---
Propiconazole	-/+	8	10	8	9	---	8	4
Pyrimethanil	-/+	10	7	7	7	10	10	7
Thiabendazole	-/+	10	7	7	10	10	10	10

6. **Current United States, Korea, Codex, and other tolerances of postharvest fungicides on lemon are shown in Table 5 (updated 09-25):**

Table 5.

Fungicide	Pre- / Post-harvest	Lemon MRLs (ppm)						
		US	Codex	Korea	China	Hong Kong	Japan	Taiwan
Azoxystrobin	+/+	15	15	10	---	15	10	10
Difenoconazole	+/-	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Mefentrifluconazole	+/-	1	1.5	1	---	---	1	1
Fluopyram	+/-	1	1	1	---	---	1	0.5
Fosetyl-Al	+/-	9	---	0.01	---	5	150	10
Fluxapyroxad	+/-	1	1	1	---	---	4	0.8
Pyraclostrobin	+/-	2	2	2	7	1	2	1
Trifloxystrobin	+/-	0.6	0.5	0.5	0.5	0.5	3	0.5
Mefenoxam	+/-	1	5	0.01	5	5	0.7	0.5
Fludioxonil	-/+	10	10	10	10	10	10	7
Imazalil	-/+	10	15	15	5	10	5	5
Natamycin	-/+	Ex.	---	---	---	---	---	---
Propiconazole	-/+	8	10	8	---	---	8	4
Pyrimethanil	-/+	10	7	7	7	10	10	7
Thiabendazole	-/+	10	7	7	10	10	10	10

Note: Difenoconazole, fluopyram, fluxapyroxad, pyraclostrobin, and trifloxystrobin are only applied as preharvest treatments in premixtures (e.g., Quadris Top, Luna Sensation, Priaxor). Natamycin and polyoxin-D do not have MRLs or FATs but are exempt from tolerance and OMRI-certified in the United States. Polyoxin-D is for preharvest and natamycin is for postharvest use only. Mefentrifluconazole (Cevya) and the premixture mefentrifluconazole/ fluxapyroxad (Elysis) are recently registered on citrus for foliar/fruit citrus diseases

7. Records for sanitation and fungicide use should be available.

B) Grading - All fruit destined for Korea should be graded.

1. Fruit found in Categories I-II may be evaluated at the NAVEK incubation lab or by an inspector with the County Agricultural Commissioner to determine if the lot should be further considered for Korean export.
2. Lots containing ice-marked fruit as shown in Category IV F-J should not be shipped to Korea and should be diverted to other markets.

C) Fruit Storage – Recommendations for fruit destined for the Korean market are as follows:

1. Fruit should be stored at 3-5°C.
2. Fruit should not be stored more than one week following packing.
3. Note: Freezing fruit (storage temperatures of 0 to –1°C) will result in increased susceptibility for Septoria Spot.
4. Packed fruit destined for Korea Export should be stored separate from domestic or other Export shipments to avoid mixing of the load.

V. **NAVEK** is a non-profit research program that is funded in-part by the industry and is cost-effective when at least 300 samples are submitted to the lab per season. As sample submissions increase, the cost of individual samples will be lower because costs for operating the UC lab are fixed. The NAVEK lab is certified by USDA-APHIS and in compliance with the international trade agreement with Korea. Research funding by the California Citrus Research Board has resulted in all the pre- and postharvest fungicide treatments (except the copper-zinc-lime treatment) currently available for Septoria spot, in the modeling and forecasting of the disease risk, industry advisories, an on-line website for submission of samples, and in the development of the GAPs for Septoria spot management. Fungicides available and modeling for disease risk is in part also posted on the UCIPM website.

TABLE A.
First Application 2025-26 Season
Zinc-Copper-Lime Applications
Fixed coppers (e.g., copper hydroxide and copper oxide)

Application Volume	Rate	Metallic Zinc/100 gal	Metallic Copper/100 gal	Hydrated Lime/100 gal
400	gal/A	0.63-1 lb	0.41-0.75 lb	0.5-1.0 lb
600	gal/A	0.42-0.67 lb	0.28-0.5 lb	0.33-0.67 lb
800	gal/A	0.31-0.5 lb	0.21-0.38 lb	0.25-0.5 lb
Total*	lb/A	2.5-4	1.65-3	2-4 lbs

* - If the disease was observed or a positive NAVEK report was issued for Septoria spot in a grower lot last season, use a higher rate of each component within the range provided.
** - Lime can be substituted with a sticker adjuvant (e.g., NuFilm-17, Cohere, etc.) when using fixed coppers. Note that zinc sulfate is acidic and may need to be buffered in the spray tank to prevent phytotoxicity. Consult a PCA if lime is not applied.

TABLE B.
First Application 2025-26 Season
Zinc-Copper Bordeaux Applications
(Zinc monohydrate + Copper pentasulfate)

Application Volume	Rate	Metallic Zinc/100 gal	Metallic Copper/100 gal	Hydrated Lime/100 gal
400	gal/A	0.83 lb	0.41-0.62 lb	5-17 lb
600	gal/A	0.55 lb	0.28-0.41 lb	3.3-11 lb
800	gal/A	0.41 lb	0.21-0.31 lb	2.5-8.4 lb
Total*	lb/A	3.3	1.65-2.45	20-67

* - If the disease was observed or a positive NAVEK report was issued for Septoria spot in a grower lot last season, use a higher rate of each component within the range provided.

TABLE C.
First or Second Application 2025-26 Season
Fungicides other than Cu-Zn-Lime Treatments

Product	Amount (fl oz or oz/A)	Application volume (gal/A)*	Ground or Air application	PHI (days)
Abound	12-15.5	200-800	Ground or Air	0
Luna Sensation**	5-6	200-800	Ground or Air	7
Oso	3.75-13.0	200-800	Ground	0
Ph-D	6.2	200-800	Ground	0
Priaxor	5-11	200-800	Ground	0
Elysis	6-8.5	200-800	Ground or Air	0
Cevya	4-5	200-800	Ground or Air	0
QuadrisTop	10-15.4	200-800	Ground or Air	0

*- Applications volumes are suggested to provide sufficient coverage and may vary for citrus crop (tree size and canopy density).
** - Luna Sensation and Cevya are not labeled for Septoria but for other diseases of citrus in CA and FL.

Restrictions:

Crop	Preharvest fungicide	Preharvest Interval (days)	Max. Product Rate (fl oz or oz/A	Max. No. of Applications	Max. No. of Sequential Apps.	Max. Product/ Year (fl oz or oz/A)
Citrus fruit	Abound	0	15.5	4	2	92.3
	Luna Sensation	7	7.6	4	2	27.3
	Oso	0	13.5	6	2	81.0
	Ph-D	0	6.2	6	2	37.2
	Priaxor	0	11	4	2	44.0
	Elysis	0	8.5	3	2	25.5
	Cevya	0	5	3	2	15.0
	QuadrisTop	0	15.4	4	2	61.5

Note:
- MRLs have been established in many countries including Korea, but some countries may not have MRLs established for these fungicides. Check with the export country before making pre-harvest fungicide treatment/application decisions (MRLs are listed for several export markets in the GAPS).
- Additional materials may be needed for managing brown rot. A fixed copper may also be used with other fungicide treatments in a tank mixture for brown rot control.

Revisions to NAVEK

Options for Septoria Management
To Minimize Copper Applications and Maintain Lot Eligibility A revised NAVEK protocol has been developed and in operation for the last four seasons and will be used again for the 2024-25 export season. Growers and packers may apply fungicide treatments based on the same schedule as in previous years with an initial application before Nov. 30th and a second or third application based on the environmental monitoring model described above. Alternatively, they can use the revised NAVEK protocol that could minimize copper applications and maintain eligibility of positive lots as follows:

For NAVEK samples **submitted after January 1**:
a)*Samples **negative** for Septoria spot* - grower lots are exempt from the secondfungicide application, but samples should be re-submitted after 45 days if theharvest is extended;

b)*Samples **positive** for Septoria spot* - the second application must be made withan anti-sporulation fungicide (e.g., Luna Sensation, Priaxor, Quadris Top) aloneor in a mixture with copper. The sample should be re-submitted after fungicideapplication and within one month before harvest to the NAVEK lab. The check box"**Re-submission after a previous positive"** on the electronic form should bechecked. Re-submitted samples will be evaluated for sporulation of the pathogen,and if there is no sporulation, the lot can maintain eligibility and be shipped. Ifpositive for sporulation, then the lot is removed from the program and should bediverted to other markets.

Based on (a) and (b) above, if a second application is not made or the second application is made with an anti-sporulation fungicide, then it is strongly recommended that fruit are treated postharvest with the highest-rated anti-sporulation fungicide Graduate A+ to minimize sporulation of *S. citri* in transit. Considerations for deciding which management alternative to follow:

Option 1: Make all copper applications based on advisories and submit samples to NAVEK lab

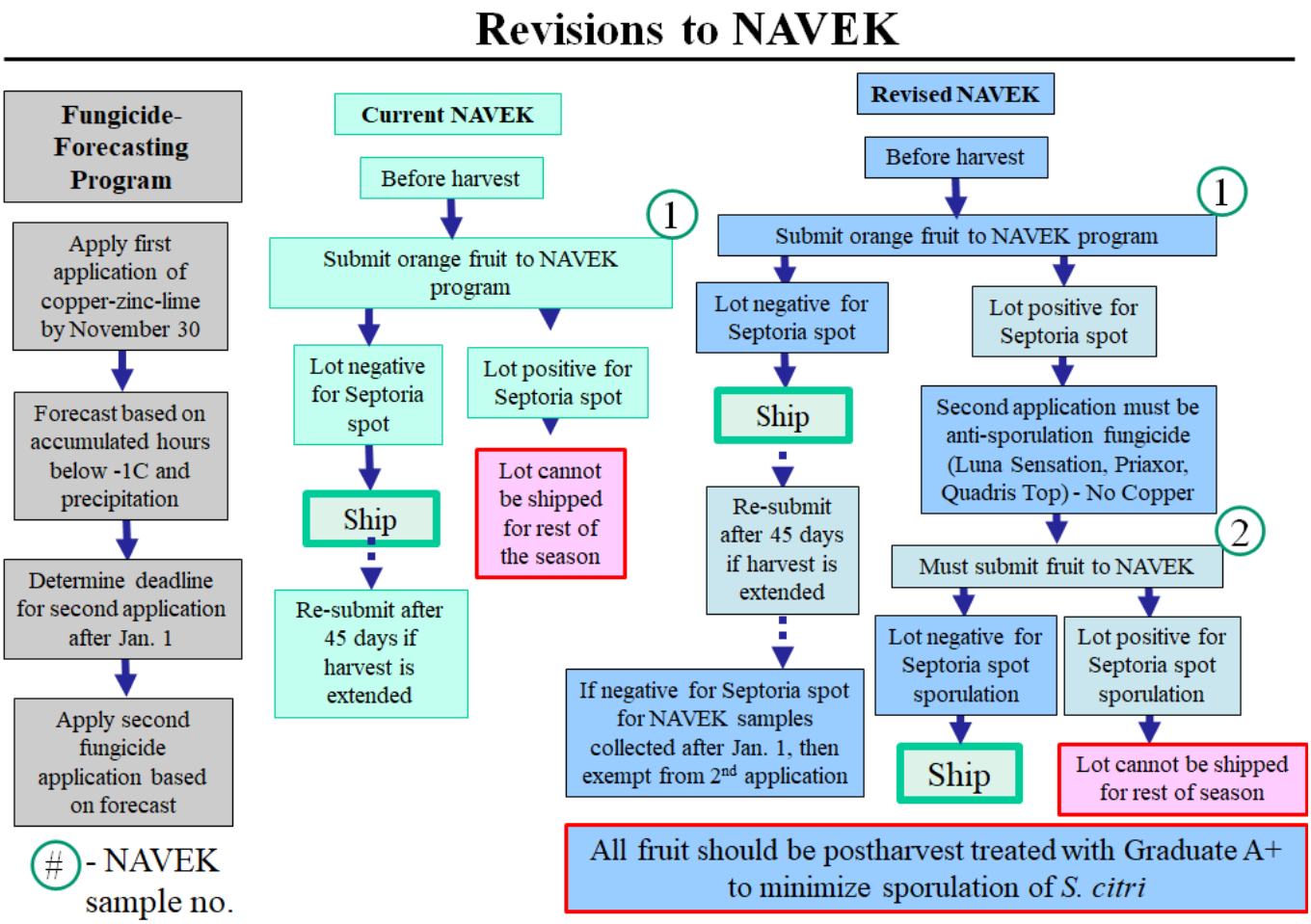
Advantages – simple to manage

Disadvantages – might require multiple copper or alternative applications; positive samples are out for the season

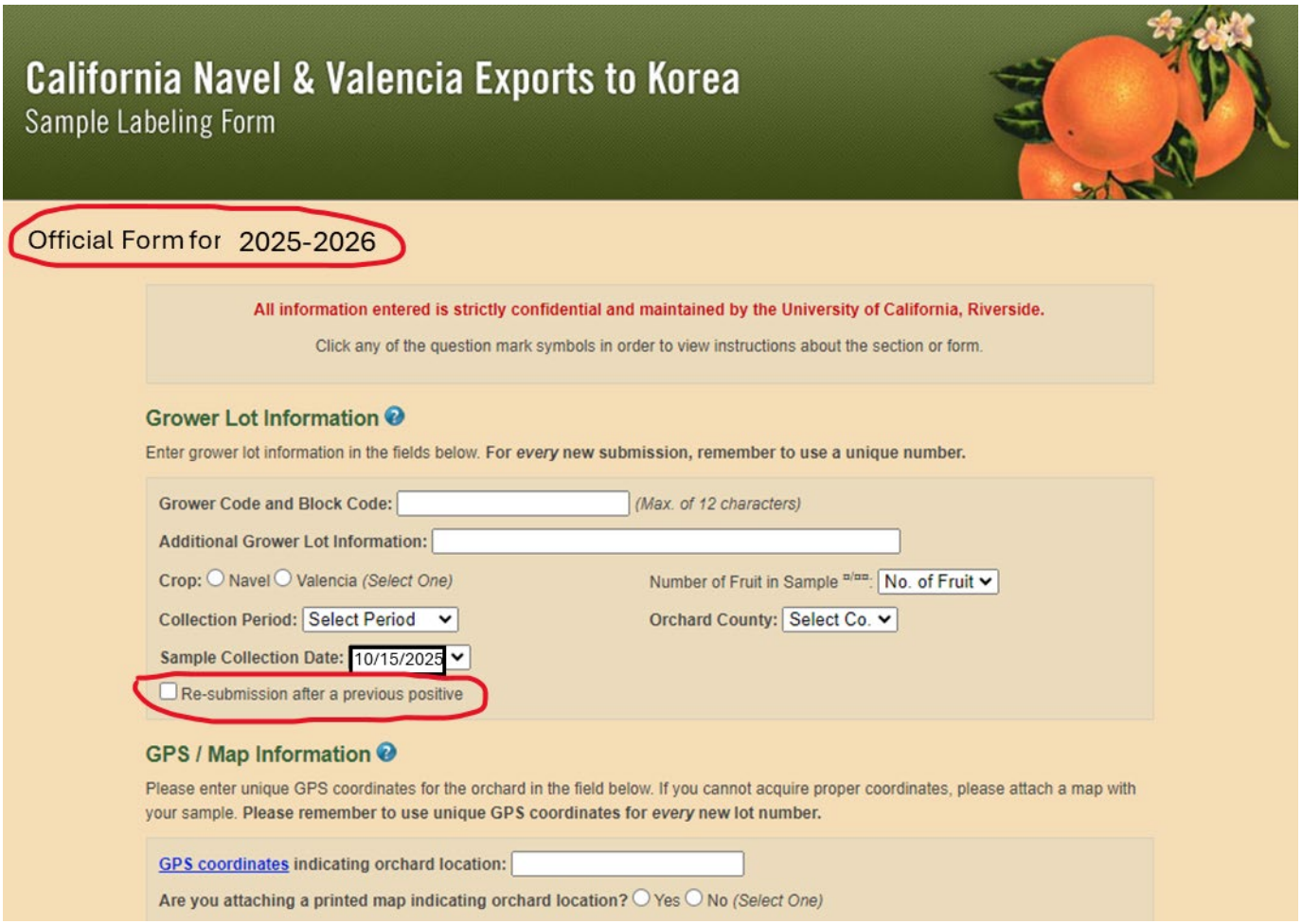
Option 2: Make first copper application and submit NAVEK samples after Jan. 1

Advantages – copper and alternative treatment applications can be adjusted based on disease pressure. This may result in reduced total fungicide applications if the NAVEK sample is negative and may provide an extra chance for positive samples to still be eligible for export provided that an anti-sporulation fungicide is applied before harvest. Overall copper usage can be minimized.

Disadvantages – extra monitoring and submission of samples to NAVEK and fruit lots still can be out for the season if sporulation occurs on NAVEK samples after the second application with an anti-sporulation fungicide.



Suppl. Fig. 1. Revised NAVEK program starting from the 2018-19 season and continuing in the 2025-26 season.



Suppl. Fig. 2. Portion of the electronic sample submission page for the NAVEK program for the 2025-2026 season. A new check-box (second red circle) has been added for the revised program (*see* text for details).