scaffolds Update on Pest Management and Crop Development

FRUIT JOURNAL

April 18, 1994 VOLUME 3 Geneva, NY

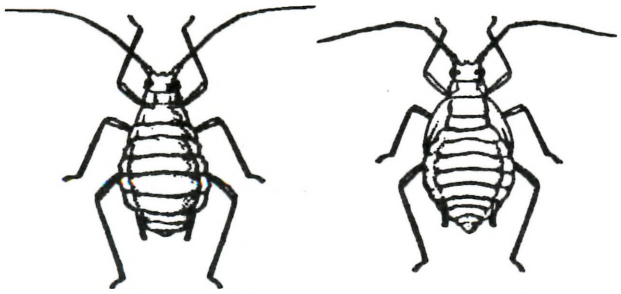
INSECTS

APHIDS

THE ROSIES THAT BLOOM IN THE SPRING

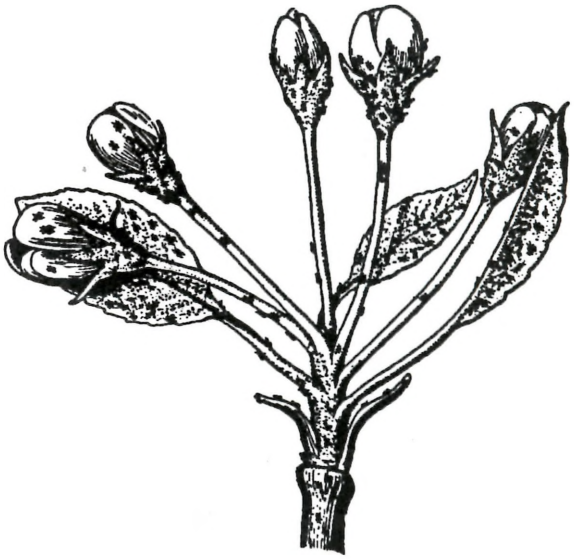
(Art Agnello & Harvey Reissig)

❖❖ Rosy apple aphid (RAA), the season's first aphid species of concern to New York apple growers, is the most damaging of the aphids that attack apples and one of the most difficult insect pests to predict from year to year. Although it feeds mainly on apple foliage, causing leaf chlorosis and curling, its saliva is also translocated to nearby fruits, which become bunched, stunted, and malformed. RAA will attack all apple varieties, but varieties such as Cortland, Monroe, R.I. Greening, Ida Red, and Golden Delicious are particularly susceptible, and those in the McIntosh family are relatively tolerant. As with most aphids, this species has a complex life cycle, starting with black eggs that overwinter, together with those of green apple aphid and apple grain aphid, on twigs, in bud axils, and in bark crevices; eggs of the three species generally cannot be distinguished. The eggs develop into solitary, wingless "stem mothers", who then give birth to living young, most of whom are also wingless. RAA nymphs are visible beginning at about tight cluster but are most easily observed at the pink bud stage. The first adults appear around bloom.



Stem mother Nymph

Second-generation adults appear 2–3 weeks after petal fall. Some of these move to alternate hosts (such as narrowleaf plantain and dock) and the rest remain in the orchard. In those orchards with an



early summer RAA problem, you can find colonies causing leaf damage and honeydew particularly in younger, succulent foliage, such as on watersprouts inside the canopy. In some cases it may be advisable to apply a treatment against these infestations if there is a danger of "spillover" (of either aphids or honeydew) to fruit clusters, but any systemic damage to fruit size and shape caused by RAA feeding will have already been initiated by the pre-bloom populations, and can't

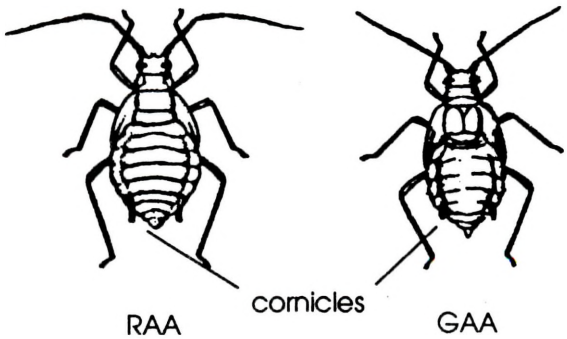
continued...

be reversed at this time. The third generation develops by mid-July and also moves to alternate hosts. Generally they will remain on these plants as wingless forms until early fall, when black winged adults are produced, which migrate back to the apple trees to eventually produce the eggs present during the winter.

Our control recommendations for RAA span the period from 1/2-inch green to the pink bud stage, using any of a number of materials: Thiodan, Lorsban, Lannate, Vydate, or Asana, listed roughly in order of increasing harm to beneficial mites. Past field trials generally indicate that pink applications of any of these products do a better job than an earlier spray. This is because, in those cases where aphid populations build up during early summer on vegetative growth inside the canopy, a pink spray is more effective than an earlier treatment at half-inch green. From the point of view of management practicality, it is therefore easier and more natural to consider the need for aphid control at the time of the pink spray.

Because RAA populations are highly variable, it is important to assess their densities before making a treatment. In past surveys, approximately 50% of the orchards sampled required treatment. If you are inspecting fruit clusters for STLM eggs at pink anyway, it is not much more trouble to note the presence of RAA nymphs or damage at the same time. We recommend, however, that a few more clusters be checked for RAA than are required for STLM sampling. Try to select 10 from the interior canopy area of each of 10 trees distributed throughout the block. Also, you should try to pick out damaged clusters to inspect. RAA nymphs are of course present at pink, and large enough to see without difficulty, but they do occur on the same tree and in the midst of colonies of green apple aphids, which are not usually a problem until the summer.

In order to distinguish among the species, you can use leaf damage as a cue, as well as the insects' color. RAA nymphs are usually pinkish, sometimes varying to a light brown, slate gray, or greenish black, and the body is covered with a whitish mealy coating. Most importantly, they have pronounced cornicles ("tailpipes"), and long antennae (more than half the body length). Green apple aphid nymphs are clearly green, and without the whitish cast. Their cornicles are little more than buttons, and the antennae are clearly less than half of the body length. Also, aphids



found inside curled or distorted leaves at pink are almost always Rosy Apple Aphids. If you find ONE infested cluster (1%, or stop as soon as you find one), we would advise including a good RAA material in your pink spray; this threshold may be a little conservative for people who are skilled at finding the aphids. ❖❖

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DISEASES

WHEN IT RAINS, IT SPORES

ASCOSPORE MATURITY DATA, REVISITED

(Wayne Wilcox)

❖❖ Scab season's just about to start, and we've already started supplying the traditional ascospore maturity counts. That means it's also time for the annual reminder about what these numbers REALLY mean, since it's awfully common to misinterpret them. For what it's worth, after 10 years of obtaining and reporting these figures I've come to believe that:

(1) A simple degree day model used to estimate ascospore maturity (see below) is at least equal to, and probably better than, the method we have traditionally used. It's also a lot faster, and can be run by anyone with access to daily minimum and maximum temperatures in their region. Furthermore, this model can be used to estimate spore maturity in local areas, where tree and pathogen development may be (and probably are) different than in Geneva.

(2) Ascospore maturity determinations are relatively meaningless taken out of context; i.e., if you don't know what the seasonal inoculum potential is in the individual orchards you're making decisions or recommendations for. For instance, seasonal inoculum doses in commercial orchards commonly range between 100 and 100,000 ascospores per square yard of orchard floor. Obviously, an orchard at the high end of this range is exposed to 10 times as many ascospores when only 1% shoot than is an orchard at the low end over the entire course of the season! We all spend too much time worrying about whether 5% or 30% of the spores are mature, and not enough time putting these percentages into context. Last year's widespread green tip infections are a perfect example: they occurred when a very small percentage of the spores were mature, but the 1992 Summer of Rain had given us an abnormally high base level to start with.

We'll keep determining and supplying our traditional ascospore maturity determinations, but let's remember how they're obtained and what they mean.

HOW WE GET THE NUMBERS.

Every week, Ron Nevill (my technician) collects a batch of scabby leaves from an unsprayed McIntosh block here at Geneva, brings them back to the lab, and conducts two different tests:

(1) Discharge test. A standard quantity of leaves is wetted up, and the scab fungus is allowed to discharge ascospores for 1 hr into a petri dish. These spores are then counted under the microscope, and the number of spores per low power (LP) field is reported. By comparing data from week to week, this gives a good measure of the relative number of spores that are ready to shoot during an upcoming rain. The only problem is that you can't figure out how many spores will be released over the entire season (thus, what percentage of the season's inoculum is represented by each discharge test) until the season is over and you add up all the numbers. However, these figures are fairly consistent from year to year, so we usually have a pretty good idea what constitutes a "low" and a "high" shoot (see table below).

(2) Maturity determination. Twenty individual fruiting bodies (pseudothecia) of the scab fungus are removed at random from different leaves, squashed on a microscope slide, and Ron counts the number of asci in each of five maturity categories, according to how they look under the scope: categories 1–3 are rated as immature, those in category 4 are rated as mature, and those asci that have already discharged their spores are placed in category 5. The problem here is that spores in category 4, which are always reported and thought of as "mature and ready to shoot", only APPEAR to be so (i.e., they look mature but aren't; sounds like some of our kids!). In actual fact, ascospores change color and look like they're ready to shoot about 1–2 weeks before they really are.

Below, I've summarized the data from our ascospore maturity determinations at Geneva over the last 6 years. These include the percentage of asci

continued...

appearing to be "mature" and those that had already discharged their ascospores, as determined by the examination of squashed fruiting bodies described above. Also included are the data from the ascospore discharge tests, expressed as we report them each week (spores/LP field, 1 hr shoot) and as a cumulative percentage of the season's total through the date in question.

Finally, for each assessment date I've also provided the number of degree days (base 32°F) accumulated after the first date of McIntosh green tip. In the early 80's, Dave Gadoury and Bill MacHardy provided data from New Hampshire suggesting that (i) the first truly mature ascospores are ready to shoot at McIntosh green tip; (ii) maturation continues slowly for the next 175–225 degree days (base 32°F) after green tip; then (iii) the vast majority of spores begin to mature rapidly after this point. Over the last couple of years, Dave has been working with Bob Seem in our Department to determine whether this model applies to NY conditions as well. Bottom line: it does.

ASCOSPORE DISCHARGE TEST

YEAR	DATE	PHEN[a]	DD32[b]	% OF ASCI "Mature"	% OF ASCI Dischrgd	Spores/LP field	Cumulative %
'88	4/14	GT	0	5	<1	6	1
	4/21	QIG	52	11	1	11	3
	4/28	HIG	123	13	2	4	4
	5/5	TC	212	14	3	29	10
	5/20	BL	583	22	37	83	24
	5/26	PF	764	18	48	118	45
	6/2		999	18	71	94	63
	6/9		1184	10	84	154	90
	6/16		1414	10	90	73	100
'89	4/21	GT	0	2	0	0	0
	4/27	QIG	61	3	0	0	0
	5/5	HIG	188	7	1	27	5
	5/11	TC	283	13	4	20	8
	5/18	P	425	47	8	149	34
	5/26	BL	684	46	26	230	73
	6/1	PF	865	39	45	96	90
	6/7		1073	11	86	52	98
	6/16		1350	2	98	9	100
'90	3/29	GT	0	6	0	0	0
	4/5	GT	55	16	1	13	1
	4/12	QIG	96	31	2	28	4
	4/19	HIG	151	25	5	35	8
	4/26	TC	287	37	7	64	14
	5/4	BL	545	-	7	217	36
	5/10	BL	656	45	23	214	57
	5/17	PF	810	31	42	24	60
	5/24		954	25	56	112	71
	5/24		1152	19	71	86	79
	6/8		1399	13	82	178	97
	6/14		1586	9	91	35	100

'91	4/4	GT	0	9	0	0	0
	4/11	HIG	189	33	5	44	4
	4/18	TC	268	21	3	90	12
	4/25	TC	348	22	6	84	20
	5/2	P	529	30	27	114	31
	5/9	BL	662	31	43	146	44
	5/16	PF	865	29	50	150	58
	5/23		1076	33	47	243	80
	5/30		1362	28	62	146	94
	6/6		1607	16	79	72	100
'92	4/16	ST	-	12	0	0	0
	4/24	QI	75	27	<1	30	3
	4/30	HIG	141	38	5	46	8
	5/6	TC	262	45	5	108	20
	5/15	BL	481	66	6	177	40
	5/21	BL	637	46	47	221	64
	5/28	PF	803	13	78	201	86
	6/4		937	17	75	58	93
	6/12		1228	2	97	66	100
'93	4/15	ST	-	10	0	0	0
	4/22	QIG	74	19	<1	3	<1
	4/29	HIG	156	31	3	14	2
	5/6	P	342	70	8	140	17
	5/13	BL	547	42	29	251	45
	5/27	PF	839	68	23	198	66
	6/3		1003	39	57	179	86
	6/9		1157	8	89	122	100

[a] PHEN = Approximate phenological stage of McIntosh trees at Geneva: ST = silver tip, GT = green tip, QIG = 1/4" green, HIG = 1/2" green, TC = tight cluster, P = pink, BL = bloom, PF = petal fall

[b] Accumulated number of degree days (base 32F) since McIntosh green tip.

INTERPRETING THESE NUMBERS. Three major points stand out:

(1) As stated above, spores that look mature early in the season often aren't ready to shoot. For example, in 1990, 16% of the spores appeared to be mature at green tip, but only 1% were actually ready to shoot when they were wetted up and given a chance (based on the cumulative-percentage-shot category). In 1991, 33% looked ready at half-inch green, but only 4% shot when wetted up; and in 1992 and '93 at quarter-inch green, 27% and 19% looked ready, but only 3% and <1% actually were ready, respectively.

(2) As predicted by the Gadoury/MacHardy model, true spore maturity (as measured by the ability of spores to discharge) proceeded slowly for the first 175–225 degree days (base 32°F) after green tip, then advanced rapidly. This start of rapid maturation usually coincided with about the tight cluster stage of McIntosh bud development. Note that the model was much less accurate in predicting apparent (morphological) maturity, which it was not designed to do.

(3) Neither tree phenology nor the degree-day model was a good predictor of when most ascospore inoculum was depleted. This may be due to differences in rainfall patterns during the various years or to inaccuracies in our sampling methods. It is likely that our figures overstate the post-bloom threat in some seasons, judging by other workers' spore-trapping studies. For instance, our sampling method does not adequately account for the decomposition of overwintering leaf litter, nor the possibility of spore entrapment by taller orchard grass at this time.

WHAT DOES IT MEAN FOR 1994?

Accumulated number of degree days since green tip and tree phenology are almost certainly better indicators of primary inoculum availability in your individual regions than are our morphological maturity (category 4) ratings made here in Geneva. We'll keep making and reporting our traditional determinations for the sake of continuity and potential research applications, but keep their applicability to local conditions (both climate and base level of primary inoculum) in perspective.

Remember that 1993 was a dry summer, with relatively little leaf scab in MOST orchards. Therefore, early infection periods should be much less important ON AVERAGE than they were last spring. Growers planning to use an SI fungicide program in orchards that had little scab last year should be able to delay their first spray until tight cluster without unpleasant surprises. Growers that had scab last year shouldn't be playing games this year. ❖❖

(Dave Rosenberger)

HUDSON VALLEY

Apple scab ascospore maturity, Highland, NY

DATE	Immature	Mature	discharged	Tower shoot
4/12	90%	9%	1%	1 spores
4/15	64%	34%	2%	15 spores

APPLE SCAB UPDATE

❖❖ Spore maturity changed very little from April 4 to April 12, but several warm days toward the end of last week stimulated rapid increases in the numbers of mature spores. The April 15 scab counts showed we were well past the 17% maturity level that I consider our economic threshold for orchards with high inoculum. I was surprised, however, that relatively few spores discharged in the shooting tower on April 15. (Usually we need about 40–60 spores in the shooting tower before we have a commercially important discharge.) The small number of spores released in the shooting tower on Friday afternoon is evidence that most of the 34% mature spores were still not quite ready for discharge. Warm weather over the weekend undoubtedly contributed to further maturation, and a significant release of ascospores is expected with the next rain period.

Hudson Valley growers who do not plan to use SI fungicides and have not applied a copper spray should apply their first scab spray before the next wetting period. This is especially important for orchards that had scab last year and for orchards bordering large inoculum sources (i.e., abandoned orchards). Copper sprays applied the end of last week will provide protection against apple scab for 7-10 days.

COPPER SPRAYS

For Apples and Pears:

As usual, the window for applying copper sprays was very narrow in the Hudson Valley this year. Copper sprays applied after quarter-inch green may contribute to fruit russetting in years when less than three inches of rain occur between half-inch green and pink. In years with rapid bud development and/or low rainfall, excessive copper residues may still be present at tight cluster and pink when copper can induce fruit russetting.

FIELD NOTES

Note that concern about copper applications after quarter-inch green applies only to trees that will be fruiting. Copper sprays can be used after quarter-inch green to control fireblight on non-bearing trees, but rates of copper should reduced to the minimum allowed on the product label.

For Cherries:

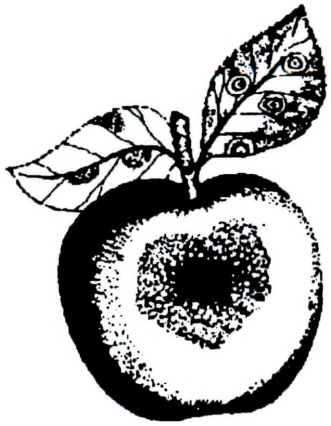
Cherry growers in the Hudson Valley have found that copper sprays applied either at leaf-fall in autumn, as a spring dormant spray, or at both timings have been very effective for reducing canker problems in sweet cherries. However, I recently spoke to one cherry grower who felt that applying copper sprays at dormant in the spring may have been reducing fruit set in his orchard. This grower is now limiting copper applications on cherries to the autumn application timing. We don't have any data concerning impacts of copper sprays on fruit set on cherries. However, it may be possible that copper residues from spring applications are redistributed by rain and reduce pollen viability and fruit set in some years. I would not expect this to occur during years with a dry bloom period, but I suspect is could be a factor when copper is not washed from trees prior to bloom and is then redistributed to blossoms by rains occurring during cherry bloom.

CEDAR APPLE RUST

Remember the wet summer of 1992? The cool wet weather we had in 1992 was ideal for building up cedar rust inoculum in cedar trees. Rust aeciospores move from apple leaves to cedar trees in mid- to late summer. The crop of cedar galls that resulted from 1992 infections are now maturing and will be supplying an abundance of rust inoculum for infecting apple trees this spring. For unknown reasons, the rust galls appear to be extruding teliohorns a bit earlier than in the recent past. This means that, provided we get appropriate prebloom wetting periods, we may see more rust infections on cluster leaves and on fruit than we have seen during the past three or four years. Fruit and cluster leaves are susceptible to infection primarily from tight cluster through full bloom. During the past several years, most rust infections occurred after petal fall and therefore caused little fruit infection. This year could be different.

Fortunately, rust infections are relatively easy to control with SI fungicides, mancozeb, or metiram (Polyram). Note that captan, dodine, benomyl, and thiophanate-methyl are ineffective against rust diseases. We also learned many years ago that the half-rates of mancozeb and metiram (3 lb/A) are not adequate to control rust in locations where orchards are immediately surrounded by cedar trees. Because most growers wish to preserve their options for using mancozeb and metiram after bloom, the best option for controlling rust under high pressure situations is to use a combination of an SI fungicide with mancozeb or metiram in the tight cluster, pink, and petal fall applications.

Cultivars like Empire, McIntosh, and Liberty that are considered resistant to cedar apple rust can still suffer damage when exposed to very high levels of rust inoculum. On these cultivars, leaves fail to develop typical yellow rust lesions. However, germinating rust spores damage enough leaf cells to allow invasion of the leaves by other weak pathogens. The resulting leaf spots are virtually indistinguishable from frog-eye leafspot. With cultivars like Liberty that are resistant to apple scab, the best solution for avoiding rust-induced leaf spotting is to locate the apple plantings well away from cedar trees. For scab-susceptible cultivars like Empire and McIntosh, rust-induced leaf-spotting can be prevented by using scab fungicides that also have activity against rust diseases. ❖❖



JUST THE FACTS

NEW GUIDE TO TREE FRUIT INSECT PESTS AVAILABLE

(Dave Kain)

❖❖ The long anticipated release of *Common Tree Fruit Pests* by retired Michigan State University entomologist Angus "Gus" Howitt is here. This is an easy-to- use, comprehensive guide to identification and control of more than 50 arthropod pests of tree fruits. The 252 pages contain many full color photos. Descriptions include each pest's life stages and history, the injury or damage it does, its host range, factors affecting its abundance, and techniques for monitoring populations. A special section also addresses beneficial insects. The book emphasizes understanding how insects and mites develop so that the grower can target control strategies at the most susceptible life stages.

Common Tree Fruit Pests is available in sturdy laminated softcover ($30) or durable hardcover ($37.50). The price includes shipping and handling.

To order

Send a request for *NCR-63 Common Tree Fruit Pests* to: Bulletin Office – TFP, Michigan State University, 10B Agricultural Hall, East Lansing, MI 48824–1034. Checks should be made payable to Michigan State University. Be sure to include your name, address, city, state, zip code and phone number (in case there are questions about your order. Allow four weeks for shipping.

(Reprinted from Michigan State University Extension, Crop Advisory Team ALERT – Fruit Edition)

Editor's Note: We now have a copy of "Common Tree fruit Pests" in our office and would like to offer our two cents worth. This is meant to be neither an endorsement nor a critical review, but merely a little more information.

The book is laid out like a field guide and is attractive and convenient to use. Pests are arranged according to the crop they are most commonly associated with starting with crop family, then crop, then according to the damage they do. This is an excellent key for field people who may not be familiar with keying insects, but can spot crop abnormalities at a glance.

Common Tree Fruit Pests is, for the most part, a book of fact sheets, concisely written with information necessary for identification and an introductory understanding of each pest. Graphs showing typical emergence patterns for each pest are a nice addition to the basic biological data usually found in fact sheets, bearing in mind that they are all given for Michigan conditions. It also includes a glossary defining some common, and some not so common, entomological and horticultural terms. This is a uniquely good idea for a reference of this type, since many of the potential users of this guide may not be familiar with technical terminology.

The book lacks sections on a few of the pests (and one notable predator mite, *Typhlodromus pyri*) that we're concerned with in the Northeast, but will serve as a good diagnostic tool for most of the insect pest situations we will encounter. Although it is a little unwieldy (about 81/2 by 11), this is a guide that you'll want to have in the field with you, not left back in the office. ❖❖

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva NY

	4/11	4/14	4/18
Green fruitworm	0.1	0	0.4
Pear psylla adults	–	–	0.05
Pear psylla eggs (per terminal bud)	–	–	1.5
Redbanded Leafroller	0	0	0
Spotted Tentiform Leafminer	0	0	0.1*

HVL, Highland NY

	4/11	4/14	4/18
Green fruitworm	1.0	0.5	0.13
Pear psylla adults	0.5	0.8	0.63
Pear psylla eggs (per terminal bud)	0.6	1.0	1.4
Redbanded Leafroller	0	0	0
Spotted Tentiform Leafminer	0	0	0

* = 1st catch

(Dick Straub, Peter Jentsch)

PEST FOCUS

Pear psylla adults active, laying eggs
Green fruitworm adults flying
1st **spotted tentiform leafminer** caught

PHENOLOGIES

Geneva: Apple(McIntosh) - **Green tip**
Cherry (Tart&sweet), Pear, plum, peach, apricot – **Swollen bud**
Highland: Apple
(McIntosh, Cortland, Empire) – **Half-inch green**
(Golden Delicious, Rome) – **Quarter-inch green**

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations		
(Geneva 1/1-4/18):	118	48
(Highland 1/1-4/18):	205	90
Coming Events:	**Ranges:**	
Redbanded leafroller 1st adult catch	32-480	17-251
Spotted tentiform leafminer 1st adult catch	73-433	17-251
Green fruitworm peak flight	64-221	19-108
Pear psylla 1st egg hatch	111-278	55-92
Rosy apple aphid nymphs present	91-291	45-148
Green apple aphid nymphs present	127-297	54-156
Tarnished plant bug adults active	71-536	34-299
Lesser appleworm 1st catch	135-651	49-377
Pear thrips in pear buds	137-221	54-101
Obliquebanded leafroller larvae active	149-369	54-196
European red mite egg hatch	157-358	74-208
McIntosh at half-inch green	112-221	54-101
Pear at green cluster	209-282	83-138
Peach at half-inch green	154-193	61-101
Plum at bud burst	68-221	33-101
Sweet cherry at bud burst	135-235	53-101
Tart cherry at bud burst	135-279	53-138

NOTE: Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide.

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