European Apple Sawfly
Being a Grou.ps forum discussion from 2010-2011

Mike Biltonen, NY
Neither Entrust nor Surround has stemmed the damage done by the EAS. Any suggestions? We're already finding larva in fruit and damage on the surface.

Michael Phillips, NH
Surround can deter a percentage of egg laying by the female provided coverage is thorough going into pink. This may lessen larval presence by as much as 40 to 60% so trap-out is advised as well. Personally, I don't like having full clay coverage during bloom. The effect of clay on the instar stages of larval development (as they move from fruitlet to fruitlet) isn't considered significant. . . though clogging the works within fruit clusters must have some effect. . . take note we'd be talking very heavy coverage here. Entrust has no effect on the adult sawfly that I'm aware of. It works by contact and ingestion when first instars move from the first scratched fruitlet to the next and the next. I look for significant presence before deciding to use this expensive biological spray. I've found it a fabulous solution to serious infestation, to the point that hardly any sawfly seems present when handthinning a couple weeks later.

Michael Phillips, NH
I'm seeing continued EAS damage on my light crop which made me ponder my declarative statement earlier that Entrust is a surefire way to nail sawfly larvae at the second and third instar stages. I sprayed Entrust this year in petal fall week . . . so how can this be? Ergo, let's look at the shelf life of this $600 a pound spray product. Dow Agro Science (the manufacturer) gives this fermented biological a 3 year lifespan, which was seconded by one research paper I just looked up that laid out all properties of spinosad. Most sellers play it safe by stating that Entrust has a minimum of 2 years’ viability. It turns out my stash of this white powder was purchased in spring 2006, making the product I used 4 years old this season. It didn't work against EAS this year as it has so successfully in other years. Consider this to be an expensive lesson learned!

Claude Jolicoeur, QUE
See this picture from a fruitlet of my Bilodeau crab, which I think could be EAS. Could someone please confirm this is really the right bug? Interestingly, this damage only occurs on a few of my varieties - this pest appears to be very picky on the varieties it likes! Currently, about 5% of the fruitlets of this tree are affected, and I sprayed Surround on it. We'll see! I also found similar damage on some Mantet fruitlets.

Michael Phillips, NH
That winding scar is absolutely damage from the first instar stage of European apple sawfly. The orangish sap indicates fruitlet entry. . . which often will be in a second (different) fruitlet if a flower cluster set more than one fruit. Observing that winding scar on abundant fruitlets is how I know to spray Entrust. The EAS larvae will go onto a third fruitlet and even a fourth, if available in a cluster, eating the seeds before exiting to get to the ground to pupate for next growing season.
The females favor outlying flower clusters first, working their way inward along the branch from there. Eggs are laid singly at the base of blossom clusters, with the added caveat that each female can sense when a flower location has already been claimed. It doesn't take all that many EAS to make a significant dent in your crop because of this. You should also know that sawfly starts as a minor pest once it reaches a particular orchard location but in a few years can become much worse. Hanging sticky cards at pink in those early years will be helpful.

Sawfly timing varies with how the season warms up. Typically early and mid-season varieties take the bigger hit, with late blooming varieties left alone. Last year that scenario was reversed and EAS damage was more apparent on Spies and such. This may have to do with ground moisture levels but I'm not sure.

Claude Jolicoeur, QUE

I had noticed in previous years that this tree dropped more of its apples than others, and I had always thought it was curculio that caused that drop. So it seems my first diagnostic was wrong...
And in effect, this tree is the earliest blooming of my apples. However, looking at other trees, I have found evidence of EAS in some, but none as much as in the Bilodeau crab.
I did some thinning on this tree. There was more than my first estimate of 5% affected fruitlet - maybe more like 20%. But this should not affect the crop really. I put the thinned fruitlets in a bucket full of water - hopefully this should reduce a bit the population.

David Maxwell, NOVA SCOTIA

Like Claude, I never really looked closely until this year, when I found up to 90% of some apple varieties infested with EAS. I concur with the observation that some varieties are clearly more attractive to EAS than others. (In some trees EAS have simply helped with the thinning.) By the time I realized what was happening, it was too late to actually do anything this year, but any input anybody has on what to do next spring would be most gratefully received. Michael refers to "a study in Quebec" using parasitic nematodes, which reduced the larval population 80%. Anybody got any experience with this? Any idea which nematode? Sources of same? (It is too late this year to pursue this, but maybe next year...) I am not alone in my experience; the organic specialist at the Kentville Research Station has experienced a dramatic increase in the population (and damage) in her orchard just in the past 2-3 years.

Michael Phillips, NH

Sawfly pupates in the soil. These badly-infested trees of yours are prime hunting ground for *Steinerernema carpocapsae* nematodes that work down to a three inch depth. June drop has passed and thus afflicted fruitlets have likely dropped, allowing the EAS larvae to make its way into the soil. A nematode application can be made on a rainy evening anytime now. The reference to a Quebec study in Apple Grower would have been the work of Charles Vincent who has helped me considerably with specific questions over the years. He's also a principal in the release of *Lathrolestes ensator*, a ichneumonid wasp native to Europe where EAS also comes from. These beneficial wasps lay an egg into sawfly larvae as these move from fruitlet to fruitlet. Hopefully the wasp will make it your way on the heels of EAS numbers building. This is a much more serious pest than most growers recognize until its too late.

David Maxwell, NOVA SCOTIA

Several different nematodes have been proposed for control, *Steinerernema* being one of the most widely cited ones. My understanding is that for these to be effective one has to get them on at a time while the larvae are migrating from the infected drop fruits into the soil. Once the larvae have pupated the nematodes can't get at them. I agree with Michael that the EAS is a
bigger problem than is generally realised. In Nova Scotia we have what is probably a unique situation; coddling moth is so rare as not to require any particular control measures at all (<10 catches in traps annually). Plum curculio likewise exists but seems to do virtually no damage. (I caught a pair of curculios engaged in obscene activities up in my orchard, but have yet to see any evidence at all of curc damage to my fruit, and the researcher at Kentville says she has seen no curc damage in her orchard either). In contrast, she has had increasing damage annually from EAS, and this year they have destroyed over 90% of my Sweet 16, and probably 50% of my Gideon and Bramley's Seedling. Essentially the EAS has become the major pest locally.

Dan Nawrocki, MA

Bene Nemes. I have used them for two years mainly to control chafer beetles. It appears I made a dent in populations this year. Still early though. Also the first year I tried them in the orchard to combat plum curculio larva. In terms of EAS, I had some noticable sawfly damage this year. I sprayed my nemes a month ago. I have used the strand **Steinernerna carpocapsae** the last two years. All of the recent literature has suggested using **Steinernema riobrave** as they are more mobile.

This company has been the only one I have been able to find online that supplies this variety: [http://www.beckerunderwood.com/en/products/biovector](http://www.beckerunderwood.com/en/products/biovector)

Has anyone ever dealt with them? I am concerned with the use of nematodes as I am unsure on how much of their application is cost effective? There is a lot of info out there about ideal application conditions etc... I am especially concerned with the very dry weather we have had this summer and the likelihood that my nemes are surviving to do much good.

Michael Phillips, NH

Finding the reference via Google wasn't hard but of course regular folk can never actually view scientific papers without paying high fees.


What's more amazing to me is finding the actual paper in my "orchard piles" and now be able to look for certain specifics that caught my eye when I originally wrote Apple Grower. This study started in a petri dish with 2nd and 3rd instars of EAS larvae collected from infested fruitlets -- mortality after 72 hours was 100%. It went on to bioassays done on quadrats of actual orchard ground beneath trees -- deliberately vested with specific counts of EAS larvae -- and then treated with the Sc nematodes on June 19 and June 22. Larvae mortality averaged in the middle 80s percentile... but you are right, David, pupae mortality when checked in late summer was practically zilch. Of course, midsummer nematode treatments were not being made either as this trial was targeting larvae. Other studies seem to indicate that 80% mortality on prepupae and pupae stages of different insects with various nematode species can be achieved. One other thing from the Vincent/ Belair study -- the following spring 78 EAS adults emerged from the untreated control but only 10 EAS adults emerged from the double nematode treated plots.

Apple sawfly seems ubiquitous in my orchard, ranging across the varieties. If you indeed see worse damage on certain varieties like Gala, applying nematodes beneath those trees now in July (so I believe) is going to make a dent. Doing this orchard-wide, as Dan points out, gets to be too expensive. And unfortunately we really can't "push and pull" sawfly like we can curculio.
to trap trees not sprayed with the kaolin clay. Plan on using Entrust next year during petal fall week, mon.

Claude Jolicoeur, QUE

I have written Charles Vincent who seems to be the main entomologist behind most of these studies. He sent me an article that he says summarises the state of knowledge on biological control of EAS. This LINK is 10 years old (and refers to articles that are 15 to 20 years old)... He tells me however that there is still some research going on an insect which is a parasite of the EAS. It doesn't seem that any efforts are spent on the nematodes for controlling EAS anymore.

David Maxwell, NOVA SCOTIA

On the basis of my severe infestation I have been landed with the task of speaking to the organic growers group all about EAS, in a couple of weeks time. Does anybody have anything to add to the following (or corrections) ?

1) Knocking off the adult sawflies with anything is probably not feasible - they are laying their eggs in the ovary of the flower at the same time as the pollinators are active, and anything which gets the sawfly will also get the pollinators

2) Surround might work, at least to some extent, but will also interfere with the pollinators, and has no effect on the larvae

3) Sticky white cards will trap out some adults, but not enough to make any actual impact.

4) Spinosad (at least as long as it is fresh) does work as long as the fruitlets are well protected, acting on the larvae as they move from one fruitlet to the next. (Does it work to prevent that first superficial damage also?)

5) the beneficial nematodes are effective in the lab, and indeed in the field also in reducing the numbers, but not enough to make any difference in actual fruit damage

6) Lathrolestes wasps are still being explored, but probably fall in the same class as the beneficial nematodes - they kill off a substantial percentage of the pest, but more than enough remain to destroy most of the crop.

7) Quassia extract, which has been used in Europe for a decade is probably the best hope. It is highly effective, and does not affect pollinators (!). Until recently growers made their own extract (by boiling quassia wood - which you can get in health food stores - in water.) Variable efficacy ascribed (by Jutta Kienzle) to uncontrolled concentration of quassin. Now being manufactured commercially (in Germany) with controlled, measured concentration of quassin, and registration being applied for (again, in Europe) We are talking about getting some and setting up a trial at the research station for next year, but I have no idea how realistic this is.

And that is it. Are there any other controls anybody is aware of? Any other advice?

Michael Phillips, NH

Good summation, David! I would add a few caveats however.
Surround applied at pink to achieve full coverage will repel 40 to 60% of female oviposition. Impact on pollinators should not be great, as blossoms opening after the clay coverage has been applied should be hospitable. The female EAS prefers to lay eggs beneath the flower petals, at the base of the blossom, and that area would be coated with clay. I also think that super heavy clay coverage might impact EAS larvae movement but I don't want to do 3 apps at pink and then renew that with 3 more apps at early petal fall.

The sticky cards are a reasonable plan in the early years when EAS first shows up in your orchard. I used to hang some 40 cards per acre and capture about 60 EAS adults per card. . . but after the 3rd season of doing this it seemed something more was called for.

I use that first instar trail (winding scar) as an indicator that the timing is now right for spinosad. Similarly, it’s a means of monitoring to determine if enough EAS presence warrants a spinosad application. This pest has fluctuations from year to year, based on previous control and climatic factors. I've seen light years where no spray application is called for. I'd also argue that that one apple in the cluster subject to this superficial damage is part of a valid thinning plan.

I've had quassia on hand for 10 years now but never tried it. I'm curious as to where you heard it was “highly effective” and what nuance of application you've read to make this be so.

David Maxwell, NOVA SCOTIA


Trials in 4 regions in Germany and Switzerland. Controls infested anywhere from 9.5% up to 70.5%. At 6 gm quassin/ha application rate primary infestation reduced between 80.2 % and 97.2% (one outlier in Jork, near Hamburg, where only 37.7% reduction - may have been affected by adverse weather.) Secondary infection control between 82% and 98%, (again with Jork being outlier, at 66.9%). Some of these sites actually monitored fruitlets with eggs laid in them, and watched the colour of the larva's eyes. When the eyes turn from red to black they are about to hatch and this served as a trigger to spray the quassia. Some sites got good control with concentrations of quassia down as low as 2 gm/ha. (Lake Constance, with control infestation of 70.5% got 92.9% reduction of primary infestation and 100% reduction of secondary infestation)

Lack of adverse effects on pollinators: Re-reading my literature, I realise that I was in error. (Not good!) The lack of adverse effect was in fact on Aphelinus mali, a parasitoid wasp which preys on woolly apple aphid. Good to know that the quassia does not harm it, but not really necessarily applicable to other vespids, (although if it doesn't harm one wasp, it is not unreasonable to postulate that other wasps/bees may be similarly unharmed) This same paper showed no ill effects on Forficula auricularia, Aphidius rhopalosiphi, Coccinella septempunctata, ((am I correct that this is the lady beetle?) , and Chysoperia carnea. (Actually, they also showed that the quassia did absolutely nothing to the developing sawfly larvae either; it was only the neonates who were affected, and they were so darned sensitive that the authors were unable to create a dose-response curve - all the newly hatched larvae expired at the lowest concentrations of quassin tested. (Kienzle J, Zimmer J, (et a lot of als). (2004) Control of the apple sawfly Hoplocampa testudinae Klug in organic fruit growing and possible side effects of control strategies on Aphelinus mali haldeman and other beneficial insects, 11'th Int'l Conference (as above)
To answer your question of “nuanced application”, if you really want to be super accurate, monitor your fruitlets, and watch for their beady little eyes to turn from red to black, then spray. You are virtually guaranteed to get excellent control. Otherwise, spray shortly before you figure the hatch is going to occur. (In another paper by Kienzle the adult flight was in 2 peaks, May 2-4 and May 10; by May 7, half the larvae were ready to hatch. By May 12, no young eggs were present, and only late stage larvae were seen. So it looks as though hatch occurs about 3 days after oviposition. Kienzle says the quassia seems to be quite adherent, and does not wash off even if it rains, and will hang around for days after spraying, so the timing does not have to be dead accurate. The quassia is effective only if ingested; it has no appreciable contact efficacy, so the fruitlets have to have a good covering of the agent to be effective. (although they sprayed at a pretty sparse rate: 1 litre/ha.)

After pondering this at length, I have concluded that the best course for me is indeed to use quassia, but, in order to avoid all issues with importing unlicensed materials from Europe, (Trifolio-M GmbH, who supplied Jutte Kienzle), it is easier to make my own extract from quassia bark, which can be obtained from herbal supply houses. The question then becomes 1) how much quassia to how much water? 2) boil it or just soak it in the water? Has anybody got any experience with this?

I would like to monitor efficacy, but am a little uncertain how to set up a valid trial in a small orchard (180 trees of 50 different varieties, many of which are represented by only 2 trees). Any advice?

A further tidbit about quassia. A supplier in Nicaragua lists quassia extract as an insect repellent used on domestic animals and, in addition, as means of ridding honeybees of varoa mites. Kienzle documented non-toxicity to Aphelinus mali; these guys are suggesting that it is equally harmless to honey bees. But Kienzle was unable to establish an LD-50 for EAS, because even the lowest doses killed off the entire population. Sounds too good to be true - kills all the EAS, while leaving the pollinators completely unaffected.

Fabio Chizzola, NY

I am very interested on trying to “fight” the EAS, this season, with Quassia extract, but it would be helpful to have some advices on David's question on how to obtain the extract from the quassia bark......
Herbal Nuance for Pests

David Maxwell, NOVA SCOTIA
One source quotes the concentration of quassin in powdered quassia wood/bark at 0.06%. i.e. 0.06 mg of quassin per 100 mg of wood. (Are we agreed to here?) This is equivalent to 0.6 mg of quassin per gm. of wood, or 600 mg of quassin per kg of wood. Jutte Kienzle was using 4 or 6 gm. of quassin/ha., which would need (for 6 gm/ha) 10 kg of wood/ha.
The few recipes I came across seem to use a hot water extract rather than trying to deal with the quantities of alcohol which would be needed for an alcoholic preparation. (Tinctures are fine for herbal preparations for people, but the quantities and volumes for spraying are quite another thing. But it is noteworthy that the FDA has classified Quassia as GRAS (Generally Regarded As Safe) in doses up to 1 gm/kg. (Note that this is vastly greater than the amount we are spraying – just 6 gm spread over an entire hectare).

Dan Nawrocki, MA
My concern would be in knowing how much quassin is actually extracted. I found the molecule structures they look very polar so water extraction should be fine. The addition of alcohol would improve rate of extraction.

Michael Phillips, NH
The quassia conclusion in the European apple sawfly thread leads to good questions about preparing herbal remedies for pests.

David Maxwell pointed out in that thread that the few recipes for preparing quassia that he came across seem to use a hot water extract rather than an alcohol preparation. Adding that “Tinctures are fine for herbal preparations for people, but the quantities and volumes for spraying are quite another thing. But it is noteworthy that the FDA has classified Quassia as GRAS (Generally Regarded As Safe) in doses up to 1 gm/kg. This is vastly greater than the amount we would be spraying – just 6 gm spread over an entire hectare.”

The constituent desired that shows efficacy against sawfly is quassiin. According to King's American Dispensatory (1898), this substance is soluble, with difficulty, in water and cold alcohol, and readily soluble in acidulated alcohol. A water infusion is indeed possible by macerating for 12 to 24 hours. It may well be that simmering the quassia wood for 30 minutes or so may help, provided this constituent is not volatile. I suspect that the commercial preps available in Europe may well be both alcohol and water-based. This is typical of a folkloric tincture as it addresses the dual nature of the constituent desired. An acetous tincture, being a mix of vinegar and alcohol, sounds best of all. That gets me wondering what vinegar straight up would do for extracting out quassiin as compared to water alone.

The classic work of Eclectic Medicine goes on to say this: On flies and other insects, quassia acts as a powerful narcotic poison, and the alcoholic extract when introduced into the cellular tissue kills small animals. Mr. Brande, in his work on chemistry, recommends a strong decoction of quassia, well sweetened with brown sugar or molasses, as an effectual poison for flies, and far preferable to the poisonous articles generally used to destroy them. It is certainly worth the trial.
What is true is we're doing some good guessing as we go about this!

Dan Nawrocki, MA

I did make an error and confirm that while very polar, quassin actually has very low solubility in water.

It is not volatile much at all with a very high boiling point. The molecular structure I was referring to is the "neoquassin". I will spare everyone a bit of chemical details but this version called neo- is after one chemical change has occurred in quassin during extraction or naturally. It looks to me like the alcohol is a necessity at least in our initial home brew concentrate because it looks like a little dab will do the EAS.

There is actually a patent on extracting quassin from quassia granted in 2008: United States Patent 7404972

Conclusion, the wood chips after 24 hours of sonification were completely tasteless.

David Maxwell, NOVA SCOTIA

We have now pulled out all the stops, and are applying for formal approval from the Pest Management Regulatory Agency to mount a proper scientific study of the efficacy of quassin to kill EAS first instar larvae, and mop up any which we haven't killed in the first instar. The quassia extract is being supplied by a German manufacturer who has developed a commercial product with a standardised concentration of quassin of 0.87%. Kienzle has shown fairly conclusively that it is the quassin which is the principle active ingredient; the neoquassin is also active, but less so. In answer to the questions about amounts, if you are making your own infusion, you need about 30 kg of wood chips to make enough infusion to spray 1 ha. of orchard. (Our product has boiled this down to 1.5 kg of powder, diluted in 1000 l of water and applied to 1 ha.) The quassin content of quassia wood varies quite widely, from 0.5% up to 1.2%, depending on source. Virtually everything in the literature on quassia extract is measured in terms of the amount of raw wood, (and hence has variable amounts of active ingredients).

Going into the 2012 season

Hi David,

What a wonderful study! That is some kind of EAS pressure as your trap counts were double what I've ever seen here. I particularly like the finding that quassia is persistent and thus the timing of the application has a week wide window, maybe even more?. I currently use Entrust (spinosad) in that week wide window, and it's quite effective, but expensive and also comes with resistance concerns in > one round populations like EAS. I assume that the coating of material on fruitlets is the ingestion scenario for instars.

Exactly. And, no, there is no further feeding attractant. But we did use a wetting agent, (an adjuvant spreader), and I recognize that this would pose an additional barrier for the registered organic folk. (Actually, the material we used is registered for organic use in Europe, but not in North America.)

And as to rates, are you talking grams of a dry product or gallons of a liquid preparation?

Ah! I obviously failed to make this clear. And it is significant and important. The farmers making their own extract on-farm were getting quite widely variable success in control. Kienzle postulated that this was due to varying (uncontrolled) concentrations specifically of two compounds - quassin and neoquassin. She got TriFolio-M GMbh, an agricultural chemical company in Germany, to make her an extract with a known concentration of quassin and neoquassin, and proceeded to test these preparations both in the lab and in the field, documenting consistent efficacy as long as
they got adequate concentrations, measured as gm of quassin/m of tree height/ha. She concluded that 6 gm of quassin/m/ha was adequate. As you will note, this did indeed seem adequate in my orchard, but in Kentville, with a much higher pressure, they needed 9 gm of quassin/m/ha. (Kienzle also determined that concentration of neoquassin had an effect, but to a lesser extent than the quassin.)

Here's the part that's missing for me: You imported a prepared quassia extract. What again, and is this something likely to be registered in either Canada or any states? I know such processes can be drawn out and expensive... which sometimes limits perfectly promising options as the profit margin just isn't there in the smaller orchard circles... when certain chemicals take care of curculio and first generation moths as well.

This is missing not only for you. Hubertus, at Trifolio-M started to apply for registration in Europe, but abandoned the effort about 3 years ago, (for reasons he has not seen fit to share with us). I think he saw our project as affording a possible route into registration in North America. On this basis he provided the material, which we brought in on an experimental permit. But my fellow researcher has now put her foot down and told him that we quite simply have neither the capability nor the willingness to do the studies needed to achieve registration. If he wants to get it on the North American market he has to fund the necessary studies himself. (He gave us the quassia extract and spreader, but no other funding. And in our last conversation with him, he appeared to be suggesting that we should fund the application for registration ourselves - clearly inappropriate.)

Amongst other things, one needs to provide studies of residue concentrations on the fruit, something which can be done only in highly specialised accredited laboratories. And we don't have access to such, even if we wanted to. The current situation is that Julia (my fellow researcher) has told Hubertus that she is not prepared to go any further unless he carries through with his application for EU registration. Apparently if it is registered in one jurisdiction, obtaining registration elsewhere is marked less arduous. Hubertus has agreed to get back to us in March with a commitment one way or another. But I fear that you have put your finger on a significant issue.

Did you gain any insights as to how one might take quassia bark and make an effective extract? And if so, any quality parameters as to quassin content in the herb? Not that that is probably specified.

Making the extract is dead easy - just heat the chipped Quassia wood in water for a couple of hours. But then determining the actual concentration of quassin in the brew is not something which one can do oneself - it needs a lab. The usual assay seems to use thin layer chromatography and mass spectrometry, neither of which are particularly exotic - your average hospital laboratory will use TLC every day, and mass spect is widely distributed. I suspect we could get such assays done in an Agriculture Canada lab quite readily, but we would need actual funding if we were to follow this route. To date we have done our studies without funding beyond the free quassia extract.

And, you are correct: the concentration of quassin varies across sources, (there are multiple varieties of bushes and trees from which one can extract the material), and also within a single source across geography and season.

I'm sorry the quassia research in Nova Scotia fell through.

I wish I knew more clearly just where this actually stands. I think the woman I was working with has pretty much dropped it, (and, in her defense, she is currently feeling very insecure as our Prime Minister has mandated cuts of 10% + of all government services, across the board, and nobody knows whether their jobs are next. She could very well be out of a job, and her best chance of retaining her position is to do exactly what she is directed to do by the bureaucracy.) The quassia thing was unfunded and unofficial research, although she did intend to publish it. Now I think she may be trying to distance herself from it, to avoid being nailed for doing research unauthorised by her bosses, which might be used as a justification for getting rid of her. I think she is still willing to support my continuing on my own, and I am planning on repeating the experiments in my own orchard again this year, and then submitting it for publication, (without Julia's name if she wishes, or with it). But I am somewhat dependent on her - she has the entire
stock of quassia extract, I am using a monitoring station which belongs to the Research Station to track degree day accumulations, and I have not been able to find non-UV reflective sticky white cards myself, (she has a supplier somewhere, but did not order them before now because she was not planning on an early spring like this.) I was hoping to get a straight answer out of her before now, but she is still skirting around my increasingly explicit queries as to where she stands. She did send me a message on Friday saying "We will talk next week".

We really need to figure out how growers can somehow do this direct from quassia bark and get effective results. Homegrown standardization? Think on it.

Your thoughts exactly parallel mine. I just don't know enough about the processes involved to know how best to proceed. It certainly sounds to me as though trying to get an official registration for the product, (eg. by recruiting a manufacturer in North America) is so difficult as to be out of the question. Which leaves the back door approach of pretending that we are making home-brew, with no particular purpose in mind, and the regulators don't need to bother their little minds about it. (As an unfortunate gentleman in the IRS said when I posed him a question about my wife's taxes, "That is out of my scope".) My sense is that this is indeed quite feasible, but the practicalities of importing significant quantities of quassia wood chips are unknown. I have noodled around in the literature a little, and it is apparent that the quantitative analysis of quassin (+/- neoquassin), is pretty simple chemistry, albeit not exactly amenable to barnyard testing. I suppose this might be worth exploring - is there some simple way of reducing the process to something which can be done on the kitchen table rather than in a fully equipped lab?

As for registration, we enter the subversive herbal world of homegrown answers with natural products. Truly. The same tiers exist in herbal medicine when we speak of standardized extracts and the medicine of the people. You are a doctor of some sort, correct?

Yes, I am an MD, now mandatorily retired (because I was judged too old, at 65), after a lifetime in Emergency Medicine.

This would make an interesting ethical discussion for some on the forum but for me, it's a settled matter. We need sane ways to grow food in the places we live, especially as we move into the post-petro era. One interesting thing about neem oil is that some certifiers can only deal with this as a "leaf polish" but don't want to hear about the effects of azadiractins or the boosting of immune function. The banner of "foliar nutrition" is much broader than the system understands. I am afraid I share your disinterest in arguing ethics. I am satisfied that quassia really is extraordinarily non-toxic, and have no qualms whatsoever in spraying it liberally, with complete disregard for whatever anybody in government may think one way or another.

David Maxwell, NOVA SCOTIA

I feel I am blundering into areas beyond my ken, and would like your perspective. I have happened upon a Swiss company who makes and sells a Quassia extract. (I am trying to get more accurate details.) They are quite happy to send me a supply, in greater or lesser amounts. It is registered and sold in Switzerland, but they have never approached EU registration, which is vastly more demanding than the Swiss version. (It sounds as if all that is needed in Switzerland is a statement that it is relatively harmless, advice not to drink it, and advice to consult a physician if you do.) They would send it simply as "Extract of Quassia amara", without any indication of what one might do with such, and without any statement of efficacy for any particular purpose, agricultural or otherwise.

Now, it seems to me that there is a direct parallel with Neem oil, (or EM, or seaweed extract), none of which are registered with government agencies. (It is unclear to me what the attitude of the Organic Certification folk is to these - do they need to be officially approved by OMRI etc before they can be used? And will OMRI approve something which has not been registered with the equivalent of PMRA? (This is the Canadian body charged with registering ag. chemicals - I don't know what your equivalent is.) (I am fully aware that you are as unimpressed with the "religious organics" as I. But you may be more aware of what their faith requires than I.) This leaves out the folk who simply want to avoid spraying toxic chemicals on their food. You are growing fruit for sale; does the FDA monitor your activities? Do they insist on testing for residues
of neem oil on your fruit, (with allowable limits? Or is it left up to your own honesty and morality not to spray tobacco extract (nicotine), or some such on your fruit just before picking? (I can remember a product called Black Leaf-40 from my childhood; it was literally a concentrated nicotine solution. It was eventually withdrawn, not because it was excessively broad spectrum [it is - it kills all living organisms], but because people kept committing suicide with it, and DDT was supposedly less dangerous to humans.)

So, my question to you is whether there is any reason why we could not bring quassia extract in - simply as an aqueous extract derived from a small tree, without any declared intent - and spray it liberally at petal fall, later selling the fruit with no further declaration. (Do you tell your customers that you sprayed Neem oil on the trees? EM? And does anybody care, or ask?)

David Maxwell, NOVA SCOTIA
We continue to build, rapidly. EAS captures may 12-1 female; May 13 1-female; may 14 - 12 (not yet sexed); May 15- 27 (not yet sexed). I have been away all day today, so haven't checked my traps, but would expect 30-50, based on the timing of trap captures last year, both in my orchard and in Kentville.

You ask about time to hatch. This is a bit more complicated, and I don't think we have good science yet. Graf studied hatch times in the lab, under controlled conditions. It clearly is temperature dependent, taking anywhere from 5 days to 30 days depending on how hot it is. But translating this to field conditions, (with varying temperatures, both diurnal and between days) has not been done as far as I have been able to find. (I want to try to see whether we can make predictions based on degree-day accumulations from, say, first catch, or some such). Zijp and Blommers did create a prediction model for emergence based on dd accumulations; this needs to be extended to predict hatch. The way the researchers track development in the field is to pick fruitlets and dissect them in the lab, retrieve the larvae and examine them for degree of maturity. In particular, they larvae develop eyes later in their development; these eyes are at first black. When they turn red, hatch is imminent, (within anywhere from 6 -12 hours.

As near as I can gather, most growers do exactly what you are doing - wait until they see primary damage, and then try to kill off any further hatchlings. The good thing about Quassia is that it seems quite persistent, seems to be rainfast, and, according to Jutte Kienzle, it doesn't much matter whether you accurately predict hatch. She suggests that as long as you get your spray on prior to hatch, it will be effective. In practical terms, last year in my orchard my first catches were in the week of May 15-22, peak emergence was during the week of May 23-May 29, and the tail end of emergence was in May 30 -June 8. We sprayed my orchard on May 31. (single spray), and it seemed to work very effectively. (Over-all damage reduced from 13.6% to 2.7%, but some cultivars much more impressive, (eg. Pink Pearl, control had 65% damage, spray tree had zero.) We did not do any sort of proper monitoring of development or eye colour, and when the actual hatch was I do not actually know. In Kentville, (where things were advanced by about 1 week in comparison to me, [it is always considerably warmer there than where I live], first catch was May 13, peak emergence was between May 16 and May 22. Julia sprayed most of her trees on May 27, but kept a block out until June 1. Damage, and efficacy were virtually identical between the two blocks (over-all damage in controls (all single cultivar - Liberty) was 35%, reduced to 3.5% (but needed 9 gm/ha of quassin to achieve this control. I was using only 6 gm/ha.) We concluded that Kienzle was probably correct - it is not critical when one sprays, as long as the Quassia is on prior to hatch.