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Stem-end saprophyte (Storage mould)

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There is an increasing prevalence of stem-end saprophyte on fruit arriving in the overseas markets. Stem-end saprophyte, previously known as storage mould, is also known as crown mould.

Identification

Stem-end saprophyte is characterised by a white to grey fluffy growth on the stem end of citrus fruit. The saprophyte is restricted to the calyx and stem end and does not spread to the rest of the fruit. It is not a rot as none of the live citrus fruit tissue is affected, only the dead wood of the stem.

Causal agent

The exact pathogen causing storage mould is being investigated, however, what is very clear is that it is a saprophyte. Saprophytes feed off dead and decaying organic matter, some targeting specific materials. In the case of stem-end saprophyte, the dead woody tissue of the calyx and stem end is the preferred food source. The saprophyte is within the tissue, so although wiping or washing the stem end will visibly remove the growth, it will re-emerge after a few days unless a disinfection product such as calcium hypochlorite is used.

Control

The postharvest research programme started a project in April 2021 to investigate the parameters and control of stem-end saprophyte. As the project has only just begun we have no scientific evidence, only anecdotal evidence. CRI will report on any findings as soon as possible. However, the following aspects are suspected to play a role in the development of stem-end saprophyte:

Wax application

It is possible that a good wax coverage around the calyx seals it and prevents moisture entry. This is important in disallowing saprophyte establishment. Additionally, it also retards gaseous exchange, thereby inhibiting saprophyte development. This may be supported by the fact that lemons are worse affected than other citrus types. Additionally, the elongated shape of lemons means that the ends are often poorly waxed. Ensuring that the correct brushes are used in the packhouse to allow the lemons to tumble and roll and be completely coated in wax is important. It is further necessary to fully protect lemons as this citrus type is more susceptible to stem-end saprophyte. Whether or not waxing is a prominent role player, good waxing is always vital to the overall protection and quality of export citrus fruit.

2,4-D application and time delays

The saprophyte feeds off the dead tissue, breaking down and digesting lignin and suberin. The longer the tissue can be kept green and alive, the better. The use of 2,4-D in the packhouse will assist in keeping the calyx green, making it less prone to attack. The other side of the coin is to deliver the fruit to the market as fresh as possible. Stem-end saprophyte has long been known to those who pack for far

markets such as Russia and Canada and the age of the fruit is definitely a contributing factor. This increase in prevalence of course might implicate the age of the fruit by the time of packing. Because of an increase in claims received from closer markets, such as the EU, priority of investigating stem-end saprophyte has been escalated.

Excessive moisture

One of the underlying requirements of saprophyte growth is moisture. Many decays, such as green mould or sour rot, obtain the required moisture from the fruit they feed off. Saprophytes feeding off dead woody tissue have very little moisture available from the substrate and so require external moisture. Any condensation occurring in the carton will be aiding the growth of stem-end saprophyte. Although very difficult to control, packhouses must be aware of delays in shipping or the fluctuations in temperature of cooled consignments. A break in the cold chain, even for a brief period, gives many postharvest pathogens a chance to continue growing. In the case of stem-end saprophyte, the break will result in condensation which provides the necessary moisture for growth.

Dead wood in trees and length of stem ends

There is a very high possibility that the stem-end saprophyte is originating, or at least proliferating, from the dead wood in the trees. Pruning out dead wood is crucial to control various latent pathogens, as well as prevent wind scaring and wounding. During pruning, and during harvesting, the tools and clippers used must be cleaned with a sanitiser between rows but at least between orchards. This is already a standard and vital practice in pre-harvest disease control.

Packhouses should ensure that fruit stems are cut properly in the orchard already (which aids in other wound and decay prevention).

CRI would like to ask that claims of stem-end saprophyte and any information gathered such as shipping temperatures or treatments be passed onto Catherine (catherine@cri.co.za), Wilma (wilma@cri.co.za) and Natasha (natasha@cri.co.za). Information such as the age of the fruit, time from picking to packing, colour plate of the fruit, cultivar etc. would be extremely valuable in finding a solution.

CRI Snykant
Verseker die toekoms van sitrus deur wetenskap
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Stingelentsaprofiete

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Die voorkoms van stingelent saprofiete raak al hoe meer algemeen op vrugte wat op oorsese market aankom. Stingelent saprofiete staan ook bekend as “crown mould” of “storage mould”

Kenmerke

Stingelent saprofiete is kenmerkend ‘n wit tot grys donserige skimmel aan die stingelent van sitrusvrugte. Die donserigheid is beperk tot die kelk en oorblysel van die stingelent en versprei nie na die res van die vrug nie. Dit is nie n verrotting nie, aangesien geen van die lewende materiaal van die vrug geaffekteer is nie, slegs die dooie hout van die stingel.

Oorsaak

Die presiese patogeen wat die stingelent saprofiete veroorsaak word ondersoek, maar wat baie duidelik is, is dat dit ‘n saprofiet is. Saprofiete lewe van dooie en vervalle organise materiaal, en sommige teiken spesifieke materiaal. In die geval van stingelent saprofiete, is die dooie houtagtige materiaal van die kelk en stingelent die verkose gasheer. Die swam is binne-in die materiaal, so deur die vrug af te vee of te was sal die dons verwyder, maar die swam sal weer verskyn na n paar dae, tensy n ontsmettingsmiddel soos kalsium hipochloriet gebruik word.

Beheer

Die na-oes navorsingsprogram het in April 2021 met 'n projek begin om die parameters en beheer van stingelent saprofiete te ondersoek. Aangesien die projek pas begin het, het ons op hierdie stadium geen wetenskaplike bewyse nie, slegs anekdotiese bewyse. CRI sal so spoedig moontlik verslag doen oor enige bevindings. Daar word egter vermoed dat die volgende aspekte 'n rol speel in die ontwikkeling van stingelent saprofiete:

Waks-aanwending
Dit is moontlik dat 'n goeie waksbedekking rondom die kelk dit verseël en voorkom dat vog binnedring. Dit onderdruk ook gasuitruiling, wat dit vir die swam moeiliker maak om te ontwikkel. Dit kan ondersteun word deur die feit dat suurlemoene meer geraak word as ander sitrussoorte, terwyl die langwerpige vorm van suurlemoene beteken dat die punte dikwels swak met waks bedek word. Dit is belangrik om te verseker dat die korrekte borsels in die pakhuis gebruik word, sodat die suurlemoene kan tuimel en rol en heeltemal in waks bedek is. Dit is verder nodig om veral suurlemoene te beskerm, aangesien hierdie sitrussoort meer vatbaar is vir stingelent saprofiete. Of waks 'n prominente rolspeler is of nie, goeie waks-aanwending is altyd belangrik vir die algehele beskerming en kwaliteit van sitrusvrugte.

2,4-D toediening en vertraging van toediening

Die saprofiet voed op die dooie weefsel, breek en verteer lignien en suberien. Hoe langer die weefsel groen en lewendig gehou kan word, hoe beter. Die gebruik van 2,4-D in die pakhuis dra by om die kelk groen te hou, sodat dit minder geneig is om af te val. Die ander kant van die muntstuk

is om die vrugte so vars moontlik aan die mark te lewer. Diegene wat vir vér markte soos Rusland en Kanada verpak, is lank reeds vertroud met die saprofiet. Die ouderdom van die vrugte is beslis 'n bydraende faktor. Dit kan natuurlik die ouderdom van die vrugte teen die tyd van verpakking impliseer. Die toename in eise van nader markte, soos die EU, het die prioriteit van die ondersoek na stingelent saprofiete verhoog.

Oormatige vog

Een van die onderliggende vereistes van swamgroei is vog. Baie bederf, soos groen skimmel of suurvrot, verkry die nodige vog van die vrugte wat hulle voed. Saprofiete wat dooie houtweefsel aanval, het baie min vog beskikbaar van die substraat en benodig dus eksterne vog. Enige kondensaat wat in die karton voorkom, sal die groei van stingelent saprofiete aanhelp. Alhoewel dit baie moeilik is om te beheer, moet pakhuise bewus wees van vertragings met die versendings, of die temperatuurskommelings van verkoelde besendings. 'n Onderbreking in die koueketting, selfs vir 'n kort tydperk, gee baie na-oes patogene die kans om aan te hou groei. In die geval van stingelent saprofiete, sal die breek in die koueketting kondensasie tot gevolg hê, wat die nodige vog vir groei tot gevolg het.

Dooie hout in bome en stingelent lengtes

Daar is 'n baie groot moontlikheid dat die stingelent saprofiete afkomstig is, of ten minste vermeerder uit die dooie hout in die bome. Om dooie hout uit te snoei is van kardinale belang om verskillende latente patogene te beheer, asook om windmerke en wonde te voorkom. Tydens die snoei en tydens die oes moet die gebruikte gereedskap en knippers skoongemaak word met 'n ontsmettingsmiddel tussen rye, maar ten minste tussen boorde.

Pakhuise moet toesien dat vrugstingels reeds in die boord kort gesny word (wat help met die voorkoming van wonde en bederf).

CRI versoek dat eise as gevolg van stingelent saprofiete en enige inligting rakende verskepingstemperature of behandelings aangestuur word na Catherine (catherine@cri.co.za), Wilma (wilma@cri.co.za) en Natasha (natasha@cri.co.za). Inligting soos die ouderdom van die vrugte, tydsduur van pluk tot pak, kleurplaat van die vrugte, kultivar ens. sal van groot waarde wees om ‘n oplossing te vind.