

LAEVELD AGROCHEM

GREI



Uitgawe 32: 2026 Winter

PLANTVOEDING

Carbohydrates in macadamia production

EndoPrime® SC: Versterk opbrengs-
potensiaal van die wortels af

Trillum® and the Nitrology® foundation
for stronger soybeans

Activating calcium utilisation
with KELPURA™

Ammoniumsulfaat as die
voorkeur-soutbyvoegmiddel

Unlock foliar potential
with precision pH

GEWASBESKERMING

Trichogrammatoidea control
for tortricid pests

Innovation meets exceptional
insect control

TEGNOLOGIE

START TECHNOVATION™
Presisiegedrewe invoorbestuur



Saam boer ons vooruit



GEWASBESKERMING | PLANTVOEDING | PRESISIEDIENSTE

www.laeveld.co.za

LOCALLY PRODUCED NICHE PRODUCTS

Wow! buy



YOUR ONLINE STORE FOR INCREDIBLE DEALS

Carnivorous Plants • Agriculture Books • Craft Gin
• Artisan Soaps • Body Creams • Roasted Coffee
Beans • Rooibos Tea • Cheese • Caviar • Honey •
Genesis Protein Meals • Scarves • Socks • It's
Bright • Nutritional Products... and much more.



www.wowbuy.co.za



Laeveld



laeveld-agrochem



agrochemlaeveld



Laeveld Agrochem



www.laeveld.co.za



Laeveld Agrochem (Edms.) Bpk. Rigellaan 410, Erasmusrand, Pretoria, Suid-Afrika.

Reg. nr. 1991/004865/07. T: 012 940 4398, E: info@laeveld.co.za.

LAEVELD AGROCHEM GROEI 32

Inhoudsopgawe

- 2 Boodskap van Kobus Meintjes
- 3 Groete van Corné Liebenberg
- 4 Nuwe LAC-agente
- 6 Onkruidevolusie en misbriede-beheer
- 10 The role of carbohydrates in macadamia production
- 14 EndoPrime® SC: Versterk opbrengs-potensiaal van die wortels af
- 18 How well does *Trichogrammatoidea* work across tortricid pests in the field?
- 22 Rooted in resilience: Trillum® and the Nitrology® foundation for stronger soybeans
- 26 Son-Safari 2026 foto's
- 30 START TECHNOVATION™: Wetenskaplike presisie om invoer-strategie te bemeester
- 34 Where innovation meets exceptional insect control
- 36 Beyond application: Activating calcium utilisation with KELPURA™
- 39 Wen teen bosindringing met Sendero®
- 40 Peste kan 'n "beach" wees... maar beheer moet presies wees
- 42 Ammoniumsulfaat: Steeds die voorkeur-soutbyvoegmiddel
- 45 GENESIS hoë-proteïen, gebalanseerde maaltyd vir almal
- 46 Unlock the full potential of foliar applications through precision pH management
- 50 Die fondament van 'n kampioen: Om 'n sterk werksetiek te vestig

AUGUSTUS 2026

VRYWARING: GROEI is saamgestel deur Laeveld Agrochem (LAC) met artikels ontvang van verskillende verskaffers in die industrie. LAC kan nie verantwoordelikheid neem vir die tegniese inhoud van die artikels nie.

© **Kopiereg.** Die publikasie en artikels bly die eiendom van Laeveld Agrochem en die maatskappy se verskaffers. Alle regte voorbehou. Alle publikasie-navrae kan gerig word aan info@laeveld.co.za.

Die inligting in die tydskrif word in goeder trou na die beste van ons vermoë verskaf, maar die bedoeling is om inligting te deel en nie om aanbevelings te maak nie – enige klient moet altyd steeds sy/haar naaste Laeveld Agrochem-agent raadpleeg vir advies of aanbevelings.





Ná elke oes kom daar 'n tyd om stil te staan en terug te kyk. Om oor die afgelope seisoen te besin is belangrik – dit is die eerste stap wat ons voorberei vir die nuwe seisoen. Wat het goed gewerk? Waar was daar ruimte vir verbetering? Watter lesse moet saamgeneem word en waar kan ons verbeter?

In afwagting van die belofte van 'n nuwe seisoen, begin ons met voorbereiding. Lande word bewerk en bome word gesnoei.

Verandering herinner ons aan hierdie snoei-proses. Snoei is immers nie 'n teken van mislukking nie; dit is voorbereiding. Deur doelgerig dít te verwyder wat nie meer optimaal waarde toevoeg nie, word daar ruimte geskep vir nuwe groei en toekomstige opbrengs. Dieselfde beginsel geld vir enige onderneming wat voortdurend wil verbeter en groei.

Daarom het ons by Laeveld Agrochem (LAC) die afgelope paar weke benut om terug te kyk, te leer en só ons voor te berei vir die toekoms. Ons het besin oor hoe ons meer effektief waarde kan toevoeg, hoe ons produsente beter kan ondersteun en die nuwe seisoen met groter fokus kan aanpak. *Ons is gereed vir die seisoen wat voorlê.*

Daar is tans baie 'geraas' wat kan veroorsaak dat ons ons oog van die bal afhaal en van die plan afwyk. Hoewel faktore soos kommoditeitspryse en die klimaat 'n belangrike rol in die landbou speel, is

dit belangrik om te onderskei tussen dit wat buite ons beheer is en dit waarop ons wel 'n invloed kan uitoefen. Ons kan nie die weer beheer nie. Ons kan egter beheer hoe ons voorberei, watter besluite ons neem, hoe ons insette bestuur en hoe ons verseker dat elke belegging so doeltreffend moontlik aangewend word.

Dit is ook die kern van ons benadering by LAC: om saam met produsente op praktiese oplossings te fokus wat waarde toevoeg.

Ons onlangse Son-Safari Landbouskou in Mauritius was 'n besondere voorbeeld hiervan. Saam met byna 200 produsente en hul gesinne het ons die geleentheid gehad om kennis te deel, verhoudings te bou, te ontspan, te leer en – miskien die belangrikste van alles – te luister. Deur dié gesprekke met produsente en vennote kry ons 'n beter begrip van die uitdagings en behoeftes op plase. Só kan ons voortgaan om oplossings te ontwikkel en te lewer wat produsente help om die beste moontlike opbrengs uit hul beleggings in gewasbeskerming en plantvoeding te verkry.

Die nuwe seisoen lê nou voor – daarvoor is ons dankbaar. Alhoewel ons nie alles kan beheer en voorspel nie, kan ons kies hoe ons dit gaan benader. Met goeie voorbereiding, die regte kennis, doelgerigte besluite en sterk verhoudings kan ons saam vorentoe die pad suksesvol stap.

Mag hierdie seisoen vir elke produsent 'n suksesvolle een wees. By LAC sien ons daarna uit om saam met julle te leer, aan te pas en te groei.

SAAM boer ons vooruit!



Beste Laeveld-familie

Hoop is 'n interessante konsep: Jy kan dit nie koop, verdien, opberg of op 'n trekker laai nie. Jy kan dit nie meet, weeg of met 'n drupper toedien nie. En tog is dit een van die belangrikste bestanddele van enige suksesvolle boerdery.

Elke saad wat geplant word, is eintlik 'n verklaring van HOOP. Elke nuwe seisoen begin met hoop. Elke boord wat versorg word, elke land wat voorberei word en elke investering wat gemaak word, dra dieselfde boodskap: Ek HOOP dat môre beter kan wees. *Boere verstaan dit beter as enigiemand anders.*

Landbou is van die min bedrywe waar jy vandag die werk doen, maar eers heelwat later die resultate sien. Jy plant sonder waarborge. Jy maak besluite sonder om volgende maand se weer te ken. Jy belê tyd, geld en energie sonder enige sekerheid dat alles volgens plan gaan verloop. Tog staan produsente elke jaar weer op, trek hul vellies aan en pak die nuwe dag met ywer.

Dit is nie net deursettingsvermoë nie. Dit is HOOP in aksie.

Ja, ons leef in uitdagende tye. Insetkoste styg, markte verander, regulasies neem toe en die wêreld lyk soms meer onseker as ooit tevore. Dit is maklik om vas te kyk teen alles wat verkeerd kan loop. Maar die geskiedenis van Suid-Afrikaanse landbou vertel 'n ander verhaal.



Dit is die verhaal van mense wat telkens maniere gevind het om uitdagings in geleenthede te omskep. Mense wat geleer het om aan te pas, te verbeter en aan te hou vorentoe beweeg. Van Nisboere tot Megaboere en almal tussenin, elke klein uitdaging word 'n nuwe geleentheid om te verbeter, te vernuwe en slimmer te werk.

By Laeveld Agrochem glo ons steeds in die toekoms van Suid-Afrikaanse landbou. Ons glo in die mense wat elke dag opstaan om voedsel te produseer. Ons glo in innovasie, in deel van kennis en in die ongelooflike vermoë van produsente om oplossings te vind waar ander net probleme sien. Ons land het geen toekoms sonder suksesvolle boere nie!!

Daarom is hierdie uitgawe van GROEI meer as net 'n versameling artikels. Dit is deel van ons verbintenis om waardevolle kennis, praktiese insigte en nuwe idees met die bedryf te deel. Want wanneer kennis groei, groei geleenthede. En wanneer geleenthede groei, groei HOOP.

Mag hierdie uitgawe jou inspireer, bemoedig en toerus vir die seisoen wat voorlê. Onthou: selfs ná die langste winter kom die lente altyd weer. En waar daar hoop is, is daar altyd die moontlikheid van groei. Soos ons met elke uitgawe sê, ***“Pay it forward” en deel asseblief die uitgawe met almal wat ook hierby kan baat vind.***

WELKOM BY LAEVELD AGROCHEM
Nuwe LAC-agente



Jannie Visser
T: 082 097 5910
AGENT: PIKETBERG

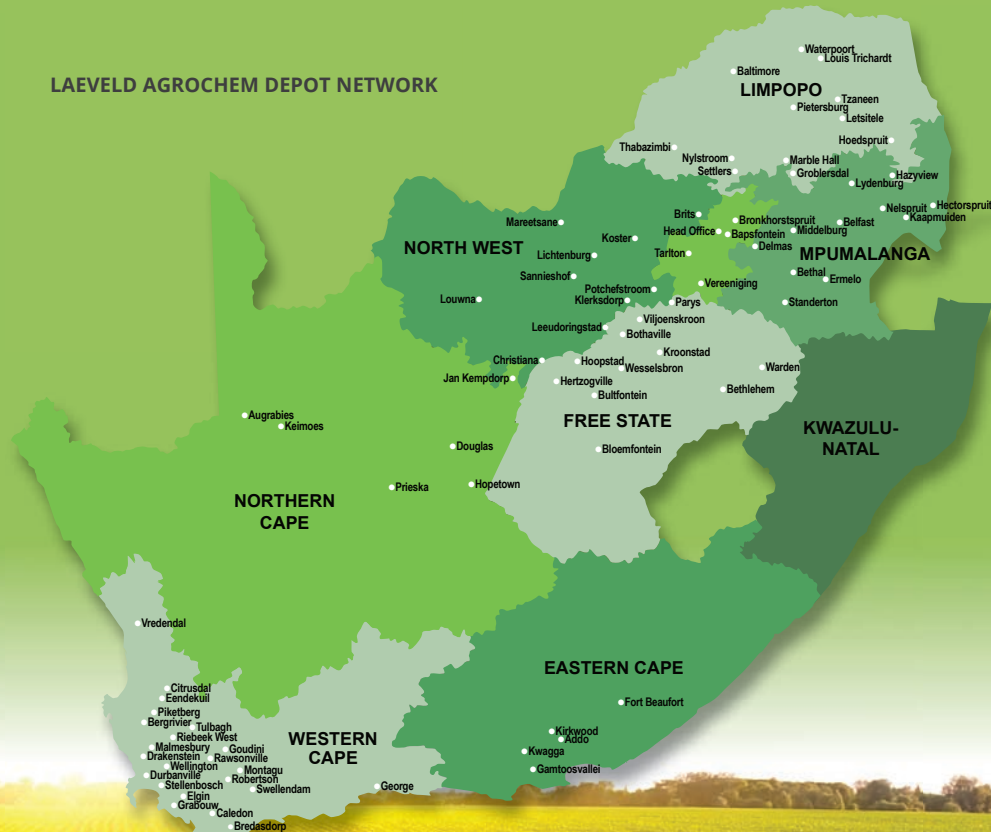


Louis Bibbey
T: 083 286 9931
AGENT: STANDERTON



www.laeveld.co.za/agents

LAEVELD AGROCHEM DEPOT NETWORK



vang onkruid voor dit groei

3 redes om sojabone met 'n voor-opkoms onkruidoder te verbou:



**Breë
spektrum**

Grasse en breëblare



**Hoë
werkverrigting**

In die stryd teen onkruid
wat moeilik beheerbaar
is soos misbredie,
kankerros en jongosgras



**Speel 'n rol in
weerstandbestuur**

Danksy twee aktiewe
bestanddele met
verskillende en
komplementêre
meganisme van werking

Eddus®

syngenta.

LEES DIE PRODUKTETIKET VOOR GEBRUIK.
EDDUS® (nie breëspektrum) bevat fomesaifen 113,85 g/l en s-metolachlor 517,83 g/l (Reg. Nr. L110360, Wet 36 van 1947). WAARSKUWING: GHS-Gevaarstelling: Kan skadelik wees indien ingestuk word. Verorsaak ernstige oogirritasie. Baie giftig vir waterlewe met langdurige effek. EDDUS® is die vervaardigingsnaam, die doelwit-ikoon en die woord Syngenta is die geregistreerde handelsmerke van 'n Syngenta Groepsmatskappij. Syngenta Suid-Afrika (Edms.) Bepk, Private Sak X80, Halfway House, 1685. Tel. (011) 541 4000. www.syngenta.co.za © Syngenta Ag. 2000. Kopiereg voorbehou. Alle ongemagtigde vermeerdering word verbied.

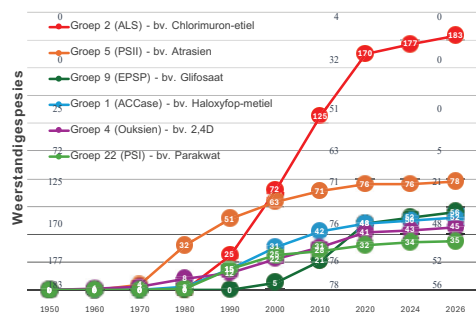
✕ @SyngentaSA | www.syngenta.co.za

Onkruidevolusie en misbrediebeheer

Internasionaal, word “onkruidodderweerstand” gedefinieer as die oorgeërfde vermoë van 'n plant om te oorleef en voort te plant na blootstelling aan 'n onkruidodderdosis wat normaalweg dodelik vir die wilde tipe sou wees. **Roundup-Ready** mielies en sojabone, is voorbeelde van onkruidodderweerstandigheid wat deur genetiese manipulasie teweeg gebring is. In die natuur, kan weerstand egter ontstaan as gevolg van seleksie.

Die stand van sake tans

Sedert 1985 is daar jaarliks gemiddeld 11 nuwe gevalle van onkruidodderweerstandigheid wêreldwyd aangeteken. Meeste gevalle kom voor binne die HRAC 2-onkruidoddergroep (183 spesies), gevolg deur HRAC 5 (78 spesies) en HRAC 9 (56 spesies). (Figuur 1).



Figuur 1: Historiese groei van onkruidodderweerstandigheid (1950–2026) soos waargeneem in die verskillende HRAC-groepe. Bron: International Herbicide-Resistant Weed Database (weedsdatabase.org).

Wanneer mens kyk na hoe onkruidspesies wêreldwyd weerstand ontwikkel het teen verskeie onkruidodder plekke van aksie (HRAC-groepe) sien ons dat *Lolium rigidum* (eenjarige raagras) tans die voorloper is, met 'n weerstandigheid teen 12 verskillende “plekke van aksie”.

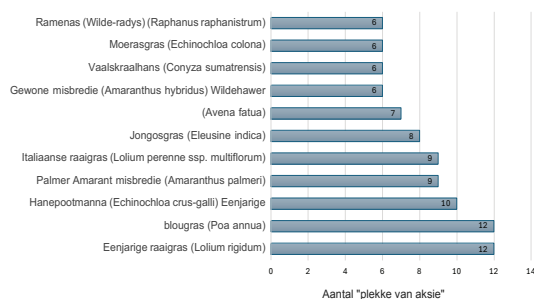
Dit beteken dat hierdie onkruid wêreldwyd weerstand teen onkruidodderaktiewes opgebou het wat afkomstig is uit 12 verskillende HRAC-groepe (Figuur 2). Onkruid wat hier gelys word, is geneig om makliker weerstand op te bou as ander onkruid, en moet fyn dopgehou word wanneer hulle moeiliker in lande beheer word.

Koring, gevolg deur mielies, rys en sojabone is die produksiesisteme waar weerstandigheid verder die algemeenste ontstaan het.

Die ontstaan van onkruidodderweerstandigheid

Baje plante, veral onkruid, bevat 'n geweldige hoeveelheid genetiese variasie wat daartoe bydra dat hulle in 'n groot verskeidenheid omgewingstoestande kan floreer.

Hierdie variasie is te danke aan die uitruil van genetiese materiaal tydens bestuiving en/of willekeurige mutasies wat van tyd tot tyd ontstaan. Op sy eie veroorsaak die toediening van 'n onkruidodder nie die mutasies binne 'n plant nie. Wanneer dieselfde onkruidodder egter herhaaldelik toegedien word, bly die weerstandige plantjies, wat natuurlik binne die populasie voorkom, oorleef en dra jaar na jaar tot die saadbank by. Met verloop van tyd vind daar dus 'n geleidelike skuif plaas na 'n oorwegend weerstandige populasie.



Figuur 2: Mees problematiese onkruidspesies en die aantal “plekke van aksie” waarteen hulle weerstand ontwikkel wêreldwyd. Bron: International Herbicide-Resistant Weed Database (weedsdatabase.org).

Dr. Maryke Craven

Tegniese Hoof – Onkruidodders, Syngenta

syngenta®



Foto 1: Misbredie in 'n sojaboonland gedurende 2024/25.

Dieselfde onkruidodderaktief wat herhaaldelik toegedien word, selekteer dus water plantjies sal oorleef en vandaar dan die seleksieproses wat weerstandigheid dryf. Die ontstaan van onkruidodderweerstandigheid is dus inderwaarheid 'n vinnige vorm van onkruidevolusie.

Onkruidodders word internasionaal gegroepeer volgens hul metode van werking, of te wel hul teikenplekke (teikensetels) binne 'n plant. Sulke groepe word na verwys as HRAC-groepe (Herbicide Resistance Action Committee). Die aktiewes binne 'n spesifieke HRAC-groep het almal dus dieselfde teikenplekke (met die uitsondering van HRAC 15 waar daar nog onduidelikheid is oor die spesifieke metode van werking).

Teikenplekke van onkruidodders sluit ensieme, proteïene of ander plekke in die plant in, waar onkruidodders bind en sodoende normale plantfunksies ontwrig. Die meeste onkruidodders beïnvloed 'n enkele spesifieke plek van werking (“werkingsplek”) wat gewoonlik onder die beheer van 'n enkele geen, of soms 'n paar gene is.

Selfs geringe veranderinge in 'n geenuitdrukking kan daartoe bydra dat die werkingsplek verander het waar 'n onkruidodder veronderstel is om in te werk en dus die ontstaan van weerstand.

Verskillende vorme van weerstand en hul implikasie

Twee tipes weerstande word onderskei naamlik teikenplekweerstand (target site resistance) en nie-teikenplekweerstand (non-target site resistance). Eersgenoemde is geneig om meer algemeen voor te kom, en behels dat daar 'n verandering aan die bindingsplek van die ensiem of proteïen ontstaan het, wat veroorsaak dat die aktief nie meer kan bind en die plant se biologiese prosesse ontwrig nie. Met nie-teikenplekweerstand, ontstaan weerstand omdat die plant sy vermoë verhoog het om die aktief af te breek (metaboliseer).



Met laasgenoemde tipe weerstand, sal produsente merk dat 'n verhoogde dosis soms die probleem oplos, maar so 'n dosisaanpassing is nie ideaal nie omdat dit die weerstand-probleem net verhoog. Verhoogde koste-implikasie, asook die impak rakende die oordrag van die aktiewe, of die effek daarvan op die omgewing, is verdere komplikasies wat so 'n praktyk ongewens maak. Beide tipes weerstande word deur herhaalde toediening van dieselfde aktiewe bestanddeel vanuit dieselfde onkruidoddergroep bevorder.

Wanneer 'n plant wat weerstand teen 'n onkruidodder toon, ook weerstand teen ander onkruidodders toon wat dieselfde plantproses teiken (dus binne dieselfde HRAC-groep), word die weerstand *kruisweerstand* genoem. >>

Die plant hoef ook nie noodwendig fisies vooraf aan hierdie ander aktief blootgestel gewees het om weerstand te toon nie.

Die weerstand ontstaan dus teen verskeie aktiewe bestanddele binne dieselfde HRAC-groep, want hulle werk almal op dieselfde teikenplek in, wat nou verander het. Vrugtelose besteding is dus die voorland indien hierdie tipe weerstand voorkom, en die produsent onwetend besluit om wel 'n ander aktief te spuit, maar wat nog steeds binne dieselfde HRAC-groep val.

Die veiligste is dus om van die begin af aktiewe bestanddele vanuit ander HRAC-groepe in te span wanneer daar onkruidodderweerstandigheid vermoed word. *Veelvuldige weerstand* kom voor wanneer 'n onkruid weerstand toon teen meer as een onkruidodder met *verskillende* metodes van werking (dus van verskillende HRAC-groepe).

Hierdie tipe weerstand skep baie probleme en kan daartoe bydra dat 'n spesifieke gewas nie meer geplant kan word nie, weens 'n gebrek aan geregistreerde onkruidodders wat nog effektief sal wees. Hierdie tipe weerstand kan reuse koste-implikasies inhou, soos bv. indien handarbeid ingespan moet word vir 'n aggressiewe uitwissingsaksie.



Plaaslike probleemonkruid

Plaaslik het raaisgras (*Lolium rigidum*) beide kruis- en veelvuldige weerstand ontwikkel en skep hierdie gras groot uitdagings in die winterreënvalgebied. Ons somerproduksiegebiede het ook nie die ontstaan van probleem - onkruid vrygespring nie, met misbredie (*Amaranthus hybridus* – Foto 1) wat die laaste vier na vyf jaar kommerwekkende tendense begin toon het.

Alhoewel atrasienweerstandige misbredsies reeds in 1993 in die Delmas-omgewing nuus was, is die afgelope paar jare gekenmerk deur 'n toenemende hoeveelheid spuitprogramme wat oneffektiewe misbrediebeheer gegee het. In sommige gevalle is onkruidodderweerstandigheid in misbrediepopulasies egter bevestig. In 2020 is glifosaatweerstandige populasies by Winterton geïdentifiseer, terwyl sulfonielurea-weerstandigheid by Frankfort in 2022 bevestig is. Met die daaropvolgende seisoen het spuitprogramme bestaande uit terbutielasien, atrasien saam met S-metolachloor, en in ander gevalle uit diclosulam, metribusien, chlorimuronietiel en glifosaat, onbevredigende beheer in die Delmas-, Kinross-, Standerton- en Kamberg-omgewings gegee.

Die 2024/25 seisoen, wat gekenmerk was deur 'n droë eerste helfte, gevolg deur 'n baie nat tweede helfte, het weereens 'n ontploffing van misbredie gesien, wat veral prominent was in die sojaboonproduksies van die Oos-Vrystaat en Mpumalanga. Die hoop is egter dat dit nie noodwendig weerstandigheid was wat tot die reuse probleme met misbredie gelei het nie, maar eerder onvoldoende reënval wat nie genoegsaam of tydig genoeg was om voor-opkomsonkruidodders te aktiveer nie.

Ontydige en oordadige reënval later in die seisoen het egter weer na-opkomsbeheer bemoeilik of belemmer. Die massa onbeheerde misbredie sou egter ongetwyfeld 'n enorme hoeveelheid saad tot die saadbank bygedra het, wat weer vir 'n uitdaging sal sorg in die komende seisoen.



Die bestuur van probleemonkruid

Om waarlik 'n impak te maak met probleem-onkruid, bly die volg van 'n geïntegreerde beheerstrategie, bestaande uit verskeie komponente soos bewerking, wisselbou, rywydtes, kultivarkeuse, planttyd en chemiese beheer, maar die goue reël. Die toepassing van gewaswisseling, gepaardgaande met die gebruik van aktiewes vanuit verskillende HRAC-groepe, beide binne as oor verskillende seisoene, bly 'n wenresep.

Die gebruik van tenkmengsels of *Een Kan*-produkte wat reeds uit verskeie aktiewes saamgestel is, moet verder ingespan word om die ontstaan of voorkoms van weerstandige onkruid te keer. EDDUS is 'n voorbeeld van Syngenta se *Een Kan*-produkreeks.

As 'n voor-opkomsonkruidodder wat geregi-streer is in sojabone, bevat hy twee aktiewes naamlik fomesafen (113.85 g aktief/L) en S-metolachloor (517.83 g aktief /L) wat onderskeidelik tot HRAC-groep 14 en 15 behoort. Gesamentlik bied hulle beheer vir onkruid soos misbredie (*Amaranthus hybridus*) asook kankerroos (*Xanthium strumarium*).

Sy verenigbaarheid met beide METAGAN GOLD en KARATE laat ook toe vir 'n meer

omvattende pesbeheerprogram in sojabone. Neem egter kennis dat EDDUS nie geskik vir gebruik in die Noordwes-provinsie of die Westelike Vrystaat is nie.

Rakende na-opkomsonkruidodders, is toediening op die optimale tyd teen die optimale dosis krities. Onthou dat hoe groter die onkruid, hoe meer aktief word benodig om dit beheer. Deur toediening van na-opkomsdoders uit te stel tot so laat as moontlik, word die kanse van suksesvolle beheer verlaag.

Gebrekkige kalibrasie en ongunstige omgewingstoestande tydens toediening belemmer ook die potensiaal van die produk. Verlepte plante kan nie die produk effektief opneem nie, terwyl winderige toestande veroorsaak dat nie genoegsaam produk die onkruidoppervlak bereik nie. Volg etiketaanwysings noukeurig, en voeg bymiddels by soos aangedui. Waterkwaliteit kan ook ongesiens verander, en veral glifosaatprodukte kan nie effektiewe beheer verleen indien die waterkwaliteit nie reg is nie.

Die gebruik van gesertifiseerde saad help verder om ongewenste oordrag van onkruidsaad van een seisoen (of land) na die volgende te keer. Omdat onkruidodderweerstandigheid verder landswyd 'n al hoe groter probleem word, moet daar uiters versigtig te werk gegaan word met die beweging van implemente tussen plase en/of landerye. Los probleemlande vir laaste, terwyl alle toerusting wat vanaf probleemlande kom, deeglik skoongemaak moet word, voordat daar na 'n nuwe land oorbeweeg word.

Slotsom

Die wagperiodes vir veilige gewaswisseling wat aan baie van die aktiewes van die verskillende HRAC-groepe gekoppel word, is tans die grootste hindernis om onkruidweerstandige populasies effektief te beheer. Daar moet mooi gedink en beplan word om seker te maak dat die onkruidpopulasie volledig uitgewis word, terwyl daar terselfdertyd produktiewe gewasproduksie op die plaas plaasvind.

Dit sal egter soms behels dat daar anders na sisteme op die plaas gekyk moet word, of dat daar afgesien moet word van tradisionele gewasrotasiesisteme.

The role of carbohydrates in macadamia production

Dr. Jakkie Stander
Commercial Head – Products, Agri Technovation



Carbohydrates as the foundation of tree performance

Carbohydrates (CHOs), or non-structural carbohydrates (NSCs), form the foundation of productivity in macadamia trees. Produced through photosynthesis, these compounds – primarily sugars such as sucrose and storage forms like starch – serve as the main energy source for all physiological processes, including growth, maintenance and reproduction. In perennial crops, carbohydrate status reflects the balance between carbon supply and demand, where photosynthetic production must exceed the combined requirements of respiration and growth for reserves to accumulate (Lötze & Brown, 2026; Shi et al., 2024).

In macadamias, this balance is particularly critical because the crop is largely photosynthesis-limited, meaning yield potential is directly constrained by carbohydrate availability.

As illustrated in Figure 1, carbohydrate accumulation can be viewed as the difference between photosynthetic income and metabolic expenditure.

Conceptual carbohydrate balance in macadamia

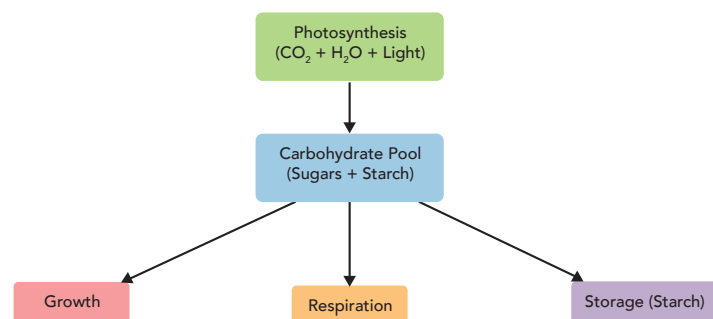


Figure 1: A conceptual diagram showing how carbohydrates produced via photosynthesis are allocated within macadamia trees to growth, respiration and storage.

Source-sink dynamics in macadamias

Carbohydrate distribution within the tree is governed by source-sink relationships. Leaves act as the primary source of carbohydrates, while developing organs such as flowers, fruit, shoots and roots act as sinks. In macadamias, reproductive structures represent the strongest sinks, competing aggressively for available energy.

This competition determines yield outcomes. When carbohydrate supply is insufficient, the tree reduces sink demand through flower or fruit drop, a phenomenon widely observed in perennial crops (McFadyen, 2006).

Flowering in macadamias comes at a cost

Flowering represents one of the largest carbohydrate investments in the macadamia production cycle.

This substantial energy demand occurs over a short period, placing significant pressure on both current photosynthesis and stored reserves. Given the inherently low conversion of flowers to harvested nuts, flowering can be viewed as a high-cost, low-efficiency process from a carbohydrate perspective.

If sufficient carbohydrates are not available, the tree will shed excess flowers, directly impacting yield. After nut set, the crop removes a further significant amount of carbohydrates from the system (Figure 2) that needs to be replaced before the following season.

Valuable data insights

Agri Technovation has developed one of the largest commercial datasets on carbohydrate dynamics in macadamias, comprising more than 36 000 leaf samples and over 3 500 carbohydrate analyses. This dataset provides robust, real-world insight into how carbohydrate levels fluctuate across phenological stages and management conditions.

Data from this platform consistently show that carbohydrate levels follow predictable seasonal patterns, with declines during flowering and recovery thereafter.

These trends confirm that carbohydrate supply and demand must be carefully aligned, particularly during reproductive stages.



Figure 2: A macadamia crop which, apart from other annual sinks such as flowers and new vegetative flush, removes a significant amount of CHOs that need to be replaced every year before flower induction of the next crop.

Nutrition and carbohydrate interactions

Carbohydrate dynamics are closely linked to mineral nutrition. Both field data and peer-reviewed literature show that nutrients regulate photosynthesis, carbohydrate metabolism and assimilate transport (Cakmak et al., 2024; Lötze & Brown, 2026). >>



A well-established trend is the inverse relationship between nitrogen and carbohydrate levels, where higher nitrogen availability often shifts carbon allocation towards growth rather than storage (Yang et al., 2024). This pattern is consistently observed in commercial macadamia systems.

Rather than focusing on individual nutrients, it is more appropriate to view carbohydrate status as a reflection of overall plant balance. Nutrient interactions influence how carbohydrates are produced, transported and stored, particularly during high-demand periods such as flowering.

From measurement to management

Importantly, Agri Technovation is currently the only company offering a **commercial laboratory service for carbohydrate analysis in tree crops, known as ITEST™ CARBOHYDRATES**. This platform enables producers to move beyond indirect indicators and directly measure carbohydrate status in leaves and roots, providing actionable insights into tree energy dynamics.

The ability to measure carbohydrates directly has created new opportunities for proactive management. Through ITEST™ CARBOHYDRATES, carbohydrate status can be monitored across the season, allowing for more precise decision-making.

In addition to measurement, targeted interventions can be used to influence carbohydrate dynamics. Products such as TRY ME™ (Reg. no. K9552) and Nuts-to-Grow™ (Reg. no. K9551) have been shown to increase total carbohydrate levels following application. These approaches aim to maintain higher photosynthetic activity and improve the availability of carbohydrates during critical reproductive stages.

This combination of measurement and intervention represents a shift towards **data-driven carbohydrate management**, where decisions are based on the actual physiological status of the tree, rather than assumptions.

Linking mineral nutrition to flower carbohydrates

Recent research has further strengthened the link between nutrition and carbohydrate dynamics in macadamias. Lötze and Brown (2026) demonstrated that carbohydrate levels in macadamia flowers can be predicted from tissue mineral composition with high accuracy ($R^2 = 0,85 - 0,96$).

This confirms that carbohydrate availability in flowers – the most energy-demanding organs – is closely regulated by nutritional status. It also highlights the potential for predictive models and precision nutrition strategies to optimise carbohydrate supply during flowering.

Environmental and soil constraints

Soil and environmental conditions play a critical role in carbohydrate production. Factors such as salinity and sodicity can impair root function, reduce nutrient uptake and limit photosynthesis.

Services such as ITEST™ Soil and MYSOIL™ Classification are therefore fundamental to the interpretation of orchard condition and planning of an integrated fertiliser and crop manipulation strategy.

These constraints reduce carbohydrate availability and disrupt the tree's energy balance. Maintaining good soil structure, drainage and root health is therefore essential for sustaining carbohydrate production, particularly during high-demand periods.

Leaves, storage and seasonal dynamics

Leaves are the primary source of carbohydrate production, exporting sugars to sink organs throughout the tree. Carbohydrates are stored mainly as starch, which acts as a reserve to buffer fluctuations between supply and demand.

Seasonal changes in starch and sugar levels reflect how effectively the tree is managing its energy balance. Monitoring these patterns provides valuable insight into the tree's ability to support flowering and fruit development.

Practical implications for producers

Carbohydrates underpin every aspect of macadamia production, particularly during flowering when demand peaks sharply. The integration of large-scale commercial data, direct measurement through ITEST™ CARBOHYDRATES and emerging scientific research shows that carbohydrate status is both measurable and manageable.

By aligning nutrition, soil health and timing with the physiological needs of the tree – and by actively monitoring and supporting carbohydrate levels – producers can improve flowering efficiency, fruit set and overall productivity.

References:

- Batten, G., Blakeney, A., McGrath, V. and Ciavarella, S., 1993. Non-structural carbohydrate analysis by near infrared reflectance spectroscopy and its importance as an indicator of plant growth. *Plant and Soil*, 155–156, pp.243–246.
- Cakmak, I., Engels, C. and Rengel, Z., 2024. Role of mineral nutrients in photosynthesis and yield formation. *Advances in Agronomy*, 185, pp.141–168.
- Cakmak, I., Hengeler, C. and Marschner, H., 1994. Changes in phloem export of sucrose in response to phosphorus, potassium and magnesium deficiency in bean plants. *Journal of Experimental Botany*, 45, pp.1251–1257.
- Coetzee, Z.A., Walker, R.R., Deloire, A.J. et al., 2017. Impact of potassium supply on carbohydrate and potassium distribution in grapevine. *Plant Physiology and Biochemistry*, 120, pp.252–260.
- Han, S., Chen, L.S., Jiang, H.X. et al., 2008. Boron deficiency decreases growth and photosynthesis and increases starch and hexoses in citrus leaves. *Journal of Plant Physiology*, 165, pp.1331–1341.
- Han, S., Tang, N., Jiang, H.X. et al., 2009. Carbohydrate metabolism and antioxidant responses of citrus leaves to boron stress. *Plant Science*, 176, pp.143–153.
- Ji, L., Attaullah, K., Wang, J. et al., 2020. Root traits determine variation in non-structural carbohydrates under different drought intensities. *Forests*, 11, p.415.
- Lavon, R., Goldschmidt, E.E., Salomon, R. and Frank, A., 1995. Effect of potassium, magnesium and calcium deficiencies on carbohydrate pools in citrus leaves. *Journal of the American Society for Horticultural Science*, 120, pp.54–58.
- Lötze, E. and Brown, W., 2026. Investigating the relationship between tissue (flower) mineral analysis and non-structural carbohydrates in macadamia. Agri Technovation (unpublished internal report).
- Lötze, E. and Brown, W., 2025. Leaf sugar prediction model for perennial crops (unpublished internal dataset and model).
- McFadyen, L., 2006. Source-sink relationships in tree crops. *Australian Journal of Agricultural Research*, 57, pp.1015–1024.
- Ourry, A., Kim, T.H. and Boucaud, J., 1994. Nitrogen reserve mobilization and carbohydrate relationships during regrowth. *Plant Physiology*, 105, pp.831–837.
- Serafin-Higuera, E., Reyes-Valdés, M., García-Osuna, H. et al., 2025. Accumulation of minerals and carbohydrates and their relationship to plant morphology. *Tropical and Subtropical Agroecosystems*.
- Shi, W., Li, Y., Zhang, J. et al., 2024. Role of non-structural carbohydrates in plant stress responses and productivity. *Plants*, 13, 2837.
- Sun, T., Zhang, J., Zhang, Q. et al., 2021. Integrative analysis of nitrogen effects on apple physiology and metabolism. *Environmental and Experimental Botany*, 192, 104633.
- Yang, Y., Qiu, Y., Cheng, Y. et al., 2024. Non-structural carbohydrate content and C:N:P stoichiometry in plant tissues. *Horticulturae*, 10, 784.
- Zhao, D. and Oosterhuis, D.M., 2002. Cotton carbon exchange and nonstructural carbohydrates under boron deficiency. *Field Crops Research*, 78, pp.75–87.
- Zhao, H., Sun, S., Zhang, L. et al., 2020. Carbohydrate metabolism in apple roots under nitrogen deficiency. *Plant Physiology and Biochemistry*, 155, pp.455–463.
- Zhou, W., Gu, P., Tang, Y. and Zhang, Y., 2025. Patterns of plant non-structural carbohydrates in response to nitrogen and phosphorus enrichment. *Frontiers in Plant Science*, 16, 1659022.

EndoPrime® SC: Versterk opbrengspotensiaal van die wortels af

Johan Marais
Produkbestuurder biorasionele produkte, Philagro



Wat is mikorisa?

Mikorisa is 'n tipe swam wat in 'n natuurlike samewerkingverhouding (simbiose) met die plantwortel leef. Die mikorisa in EndoPrime® SC ontwikkel swamdrade, bekend as hifes, wat addisionele grondvolume verken waar die gewas se wortels nie normaalweg kan bykom nie. Die hifennetwerk beteken dat die benutbare worteloppervlakte uitgebrei word (vergelyk die betekenis van "miko" en "risa", wat letterlik "swam" en "wortels" beteken). Volgens die vervaardiger, Mycorrhizal Applications (MA), dui navorsing daarop dat hierdie "swam-wortels" die opneemarea van 'n plantwortel betekenisvol kan vergroot.

Daar bestaan twee tipes mikorisa, endo- en ekto-mikorisa. Die groot verskil is dat endo-mikorisa kan assosieer met ongeveer 80% van alle plante in die wêreld en ekto-mikorisa kan nie. Die woord "endo" beteken "binne-in", wat afkomstig is vanaf die swam se vermoë om tot binne-in die plantselle te penetreer waar dit dan klein "boompie-strukture", oftewel, arbuskules vorm. Hierdie arbuskules lewer dan die voedingstowwe en water direk binne-in die selle af.

Die mikorisa-simbiotiese verhouding is gebaseer op die plant se vermoë om koolhidrate deur fotosintese te produseer en van hierdie suikers met die swam te deel, in ruil vir andersins ontoeganklike water en voedingstowwe wat uit die grond of groeimedium verkry word deur die uitgebreide netwerk van hifes (swamdrade) wat deur die swam gevorm word.

Dit is 'n tweerigtingverhouding waar hulpbronne tussen die plant en swam gedeel word, en speel 'n belangrike rol in hoe gewasse funksioneer.

In moderne plaaspraktyke word hierdie natuurlike ondersteuning dikwels verminder as gevolg van grondversteuring, bewerking en omgewingstres. Gevolglik benut gewasse nie altyd die volle voordeel van hierdie wortelfunksie tydens vroeë groeistadia nie.

Dink nuut oor opbrengspotensiaal in mielies, sojabone en sonneblomme

Vir baie graanprodusente val die fokus hoofsaaklik op bemesting, reënval en kultivarkeuse. 'n Belangrike faktor wat opbrengs beperk, word egter dikwels oor die hoof gesien, naamlik wortelontwikkeling onder die grondoppervlak.

Selfs wanneer voedingstowwe korrek toegedien word, kan gewasse slegs benut wat binne bereik van die wortels is. Vroeë seisoenstres, grondtoestande of beperkte wortelgroei, kan hierdie toegang beperk en reeds vroeg die opbrengspotensiaal benadeel.

EndoPrime® SC ontwikkel 'n netwerk van swamdrade om hierdie vroeë groeifase te ondersteun deur worteltoegang tot hulpbronne te verbeter.

Wat is EndoPrime® SC?

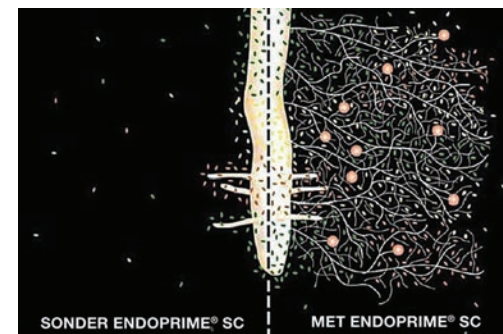
EndoPrime® SC, wat deur Mycorrhizal Applications in die VSA vervaardig word en deur Philagro SA (PTY) Ltd. in Suid-Afrika versprei word, bevat vier verskillende spesies endo-mikorisa swamme wat elk hul spesialisiteit na vore bring. Hierdie mikorisa word tydens plant naby die saad toegedien waar dit met die ontwikkelende wortelstelsel kan assosieer. Die term "assosieer" word gebruik om te beskryf hoe 'n verhouding, of 'n vorm van chemiese kommunikasie, tussen die wortel en die mikorisa tot stand kom voordat die

assosiasie plaasvind. Die plant "gee as't ware toestemming" vir die vestiging van hierdie simbiotiese verhouding.

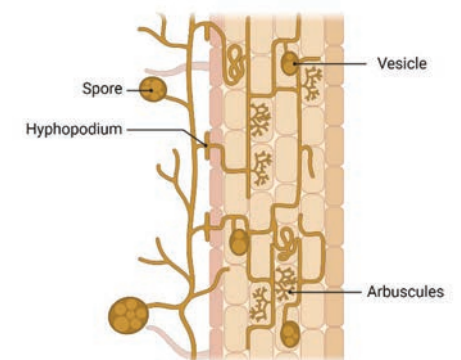
Ondersteuning van gewasse onder veldtoestande

Wanneer EndoPrime® SC tydens plant toegedien word, ontwikkel swamdrade op die wortels en dring dit die grondvolume binne waar die gewas se wortels nie normaalweg kan bykom nie.

Mikorisa speel 'n fundamentele rol in die verbetering van beide wortelontwikkeling en grondgesondheid. Die hife-netwerk wat deur die swam gevorm word, kan 'n aansienlik groter grondvolume verken as wat deur wortels alleen moontlik is. Hierdie netwerk dien nie net as 'n bewegingskanaal vir water en nutriënte nie, maar het ook die vermoë om nutriënte tydelik te stoor en geleidelik aan die plant beskikbaar te stel.



Figuur 1: Aan die linkerkant word getoon hoe die wortel se opneemarea lyk sonder die simbiotiese verhouding met mikorisa, terwyl die regterkant toon hoe die swamdrade in die grond versprei en die opneemoppervlakte van die wortel vergroot.



Figuur 2: 'n Illustrasie van hoe die mikorisa die wortel en wortelselle binnedring en boomstruktuurtjies, oftewel arbuskules, vorm om water en nutriënte tot binne-in die selle te voorsien.

Een van die belangrikste funksies van EndoPrime® SC is die ondersteuning van fosforopname. In baie landbougronde is fosfor teenwoordig, maar nie noodwendig beskikbaar vir plantopname nie. Mikorisa stel organiese sure en ensieme vry wat help om hierdie fosfor in 'n opneembare vorm om te skakel.

Wortelontwikkeling is dikwels die eerste wat deur seisoenale stres, insluitend droogteperiodes en wisselende grondtoestande, beïnvloed word. Deur die wortelstelsel vroeg te ondersteun, kan EndoPrime® SC gewasse help om beskikbare hulpbronne beter te benut en reserwes op te bou voordat droogtetoestande bereik word.

EndoPrime® SC versterk die waarde van jou bestaande bemestingsprogram om maksimum doeltreffendheid te ontsluit – nie om dit te vervang nie. Dit dra by tot meer stabiele gewasgroei, veral in seisoene waar vroeë toestande nie ideaal is nie.

Grondgesondheid en -struktuur

Benewens nutriëntopname, dra mikorisa ook by tot verbeterde grondstruktuur. Dit geskied deur die produksie van 'n natuurlike gliko-

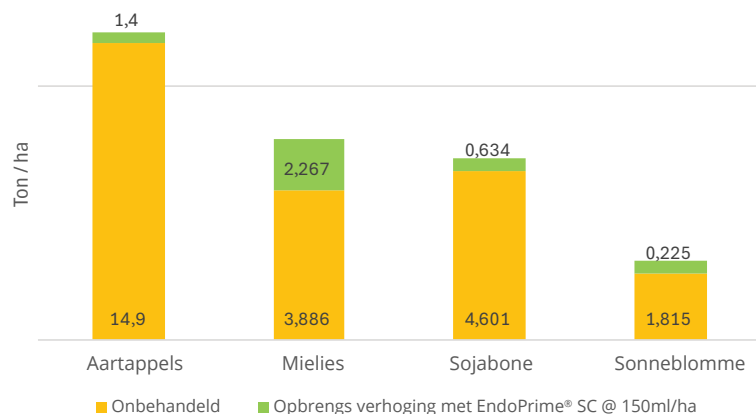
proteïen wat help om gronddeeltjies te bind. Hierdie binding bevorder grondaggregasie, wat weer lei tot beter waterretensie, verbeterde infiltrasie en minder erosie.

Hierdie aspek is veral belangrik onder Suid-Afrikaanse toestande waar water 'n beperkende faktor kan wees. Deur water beter in die grondprofiel te behou, kan gewasse langer toegang tot vog hê tydens droogteperiodes.

Wat navorsing op verskillende gewasse toon

Data wat gegenereer is oor verskeie streke en seisoene op sojabone en sonneblomme, toon betroubare opbrengsverhogings wanneer EndoPrime® SC toegedien word as 'n saad- of in-voor-toediening teen die geregistreerde aanbeveling (150 ml/ha), in vergelyking met die onbehandelde kontrole.

Soortgelyke opbrengsverhogings is ook aangeteken oor verskeie streke en seisoene op mielies, insluitend waar EndoPrime® SC doeltreffend saam met 'n vloeibare kunsmis in-voor toegedien is, wat die verenigbaarheid met bestaande plantpraktyke aandui.



Grafiek 1: Opbrengsverhogings wat behaal is tydens die 2021-2022 seisoen oor verskeie areas. Sojabone- en mielie-data is geneem in die Koppies-area, terwyl die sonneblom- en aartappeldata onderskeidelik geneem is uit die Reitz- en Moirivier-omgewings.

EndoPrime® SC bied potensiaal om tot 'n beduidende verhoging in bemarkbare opbrengs te lei wanneer die produk volgens die geregistreerde etiketaanwysings aangewend word. Soos met enige produk wat uit lewendige mikrobies bestaan, is hierdie opbrengsverhogings nie vir alle gebiede en klimaatstoestande dieselfde nie, en kan dus nie gewaarborg word nie.

Waargenome opbrengsverhogings in proewe toon duidelik dat verbeterde worteltoegang hoër produksie per hektaar kan ontsluit. Dit stel produsente in staat om insette soos kunsmis en water optimaal te benut – sonder enige verandering aan hul huidige praktyke.

Waar pas EndoPrime® SC op die moderne plaas in?

Die gebruik van biologiese produkte soos EndoPrime® SC neem wêreldwyd toe as deel van 'n groter fokus op volhoubare landbou. Hierdie produkte word nie aangewend om konvensionele insette te vervang nie, maar eerder om hul effektiwiteit te verbeter.

In hierdie konteks bied EndoPrime® SC 'n unieke waarde deur die natuurlike interaksie tussen plant en grond te herstel en te versterk. Dit ondersteun nie net opbrengs nie, maar dra ook by tot die langtermyn bewaring van grondhulpbronne. Vir suksesvolle aanwending is dit belangrik dat EndoPrime® SC so na as moontlik

aan die saad geplaas word. Hierdie nabyheid verseker dat die mikorisa vinnig met die wortel kan assosieer tydens ontkieming en vroeë groei. Soos met alle produkte wat lewende mikro-organismes bevat, moet sekere omgewingsfaktore in ag geneem word. Hoë temperature, direkte sonlig en onvanpaste mengsels met sekere landbouprodukte, kan die lewensvatbaarheid van die mikorisa beïnvloed.

EndoPrime® SC kan egter saam met verskeie ander tipes landbouprodukte toegedien word. Raadpleeg asseblief u gewasadviseur of kontak die registrasiehouer vir verenigbaarheid met ander landboumiddels, veral wanneer EndoPrime® SC in-voor of in tenkmengsel saam met 'n swamdoder toegedien word, aangesien swamdoders 'n risiko vir mikorisa inhou.

Bou konsekwentheid van onder af op

Die handhawing van opbrengskonsekwentheid is 'n belangrike fokus in graanproduksie, en die bevordering van wortelontwikkeling bied 'n doeltreffende manier om dit te versterk.

Deur die natuurlike simbiose tussen plante en mikorisa te benut, bied EndoPrime® SC 'n wetenskaplik-ondersteunende en praktiese oplossing om wortelontwikkeling te bevorder. Die resultaat is 'n meer doeltreffende benutting van water en nutriënte, groter veerkragtigheid onder stresstoestande en die potensiaal vir verbeterde opbrengs.



Begin die seisoen reg met EndoPrime® SC, 'n biologiese hulpmiddel wat gewasprestasie, insetdoeltreffendheid en weerbaarheid versterk. Ideaal vir produsente wat uitdagende, droogtegeteisterde toestande trotseer.

LEES DIE ETIKET VOOR GEBRUIK. | MYCOAPPLY ENDOPRIME® SC | Reg. nr. M480, Wet nr. 36 van 1947
Rhizopagus irregularis (381 propagules/ml), *Claroideoglomus luteum* (381 propagules/ml), *Claroideoglomus claroideum* (381 propagules/ml), *Claroideoglomus etunicatum* (381 propagules/ml) | GEVAAR | Veroorsaak ernstige oogskade.
 Philagro SA (Edms) Bpk. | Reg. nr. 1998/010658/07 | Postnet Suite #378, Privaatsak X025, Lynnwoodrif, 0040 |
 Tel: 012 348 8808

How well does *Trichogrammatoidea* work across tortricid pests in the field?

Megan Mulcahy, PhD.
& Emma Thompson



South Africa's fruit industries are operating in an increasingly constrained regulatory environment, where export compliance is tightly linked to maximum residue limits (MRLs) and reduced reliance on broad-spectrum insecticides. Within this context, biological control has become a central component of integrated pest management (IPM) programmes. The egg parasitoid, *Trichogrammatoidea cryptophlebiae*, is one of the key tools being deployed against tortricid pests, but its performance across different host species requires careful interpretation for this wasp to be used successfully.

Before a biological control agent can be applied effectively in crops, it's important for users to understand its fundamental host range. In other words, we need to understand which pest species the agent can target in the field and its efficacy against those targets. This can be done through choice and no-choice testing in the laboratory, and through testing in the field once the parasitoid has been released.

A common source of confusion arises from the difference between laboratory-derived host preference and field-level performance. Understanding this distinction is essential for setting realistic expectations and optimising deployment strategies.

Interpreting laboratory results

Laboratory results provide a clear baseline for host range confirmation. Biocontrol agents are typically tested under no-choice conditions as a first step. This type of test involves exposing the biocontrol agent to a single host species and assessing its ability to target that species. In no-choice tests, *T. cryptophlebiae* readily parasitised all tested tortricid hosts and successfully completed its development. In these experiments, the wasp parasitised the majority of available eggs in each replicate, with consistent adult emergence. The results indicate that the tortricid hosts are physiologically suitable and can support parasitoid development.

Thus, the no-choice tests confirmed that *T. cryptophlebiae* has a broad fundamental host range, which includes *Thaumotibia leucotreta* (false codling moth), *Cydia pomonella* (codling moth), *Cryptophlebia peltastica* (litchi moth) and *Lobesia vanillana* (vanilla moth).

After confirming host range through no-choice tests, biocontrol agents are typically assessed using choice tests. In choice tests, the biocontrol agent is given a choice of host by exposing it to two or more species at the same time. This is used to assess whether the agent in question has a preference for certain targets or hosts. When the same number of eggs from different host species were presented simultaneously to *T. cryptophlebiae*, parasitism was distributed more unevenly. For example, in mixed-host exposures, one host species could receive most parasitised eggs, while alternative hosts in the same arena received substantially fewer, despite equal availability.

This outcome reflects behavioural selection by the female parasitoid. Females allocate eggs based on cues associated with host suitability, including egg size, age, and chemical signals. These factors can differ between hosts and may lead to increased or decreased parasitism depending on the female's preference.

However, these results should not be interpreted as evidence that less-utilised hosts will not be parasitised under field conditions. Choice experiments impose artificial conditions in which hosts are equally available and encountered at the same time, a situation that rarely occurs in commercial production systems.



Opportunistic foraging in the field

In the field, *T. cryptophlebiae* functions as an opportunistic parasitoid rather than a strict selector among co-occurring hosts. The wasp moves through the crop environment and encounters host eggs sequentially rather than simultaneously. Parasitism is therefore driven primarily by encounter processes rather than by side-by-side comparison of host species.

This distinction is critical. Even if a host is less preferred in a controlled choice test, it may still be parasitised at meaningful levels in the field if it is encountered frequently. The realised host range is therefore broader than laboratory preference data alone would suggest, and is shaped by ecological factors such as host availability, spatial distribution, and timing relative to parasitoid activity. >>



Mechanisms of host location

The ability of *T. cryptophlebiae* to locate host eggs is governed by a sequence of behavioural responses that are largely conserved across tortricid systems. Female wasps initially respond to semiochemical cues associated with host presence. These may include plant volatiles induced by herbivory as well as compounds associated with oviposition. As the wasp moves closer to the source, it uses oviposition pheromones deposited by the pest female to refine its search area. At close range, visual cues assist in locating individual eggs, after which antennal drumming and probing are used to assess suitability prior to oviposition.

Importantly, these cues are not highly species-specific at the scale of the crop environment. Many tortricid species utilise similar oviposition sites, such as fruit surfaces, and produce chemical signatures recognisable to the parasitoid. As a result, the host-location process does not fundamentally change between tortricid species and crop type. The parasitoid is effectively responding to a generalised set of host-associated cues rather than targeting a single species.

Implications of egg distribution and accessibility

Because host-location behaviour is generalised, the spatial distribution of eggs within the crop becomes a primary determinant of parasitism. Eggs that are more abundant, or more synchronised with parasitoid activity, are more likely to be encountered and parasitised. Conversely, sparsely distributed eggs, or pest oviposition that is mistimed with parasitoid presence, may escape parasitism regardless of their suitability as a host.

This explains why laboratory preference does not always translate directly into in-field outcomes. In practice, egg accessibility and timing often outweigh intrinsic preference when determining parasitism levels.

Implications for IPM deployment

From an IPM perspective, *T. cryptophlebiae* should be considered a broadly applicable egg parasitoid capable of contributing to the suppression of multiple tortricid pests.

Its effectiveness depends less on host identity alone and more on aligning parasitoid activity with the presence of susceptible host eggs.

Successful deployment therefore relies on several interacting factors:

- 1. Release timing:** Releases should be timed to coincide with early oviposition periods, as younger eggs are more suitable for parasitism and result in higher emergence success of the parasitoid offspring.
- 2. Application rates:** Adequate quantity and spatial distribution of parasitoids within the crop is important to maximise host encounter rates.
- 3. IPM compatibility:** Care must be taken to avoid disruption from insecticides that are harmful to parasitoids, as these can significantly reduce field efficacy. Softer pest management solutions and IPM compatible chemicals should be prioritised when using biocontrol agents.



Practical implications for growers and technical managers

From an operational perspective, the distinction between laboratory preference and field behaviour has direct implications for how *T. cryptophlebiae* should be used.

Firstly, the parasitoid should be regarded as a system-wide tool rather than one restricted to a specific tortricid species. Because it parasitises eggs that it encounters, its effectiveness is strongly linked to how well releases are aligned with pest oviposition periods.

Poor timing will reduce parasitism regardless of host suitability, whereas well-timed releases can result in substantial egg mortality across multiple pest species.

Secondly, field coverage is critical. The wasp's ability to encounter eggs depends on its distribution within the crop. Even a highly effective parasitoid will underperform if release density or spatial coverage is insufficient to ensure consistent contact with host eggs.

Finally, chemical compatibility remains a key constraint. The use of non-selective insecticides can significantly reduce parasitoid survival and disrupt host-location behaviour, effectively negating the benefits observed in laboratory trials.

Taken together, these factors emphasise that successful use of *T. cryptophlebiae* depends on aligning biological understanding with practical field implementation.



Conclusion

Laboratory studies demonstrate that *Trichogrammatoidea cryptophlebiae* has a broad physiological host range across tortricid species. Choice experiments further show that the parasitoid exhibits behavioural preferences under controlled conditions. However, field performance is governed by opportunistic foraging, host encounter rates, and crop-level dynamics.

For industry application, this means that *T. cryptophlebiae* should not be viewed as a narrowly targeted agent limited by laboratory preference patterns. Instead, it functions as a flexible biological control tool capable of parasitising a range of tortricid hosts, provided that eggs are encountered under suitable conditions.

Understanding this distinction between laboratory behaviour and field ecology is essential for integrating the parasitoid effectively into IPM programmes and achieving consistent pest suppression under commercial conditions.

Rooted in resilience: Trillum® and the Nitrology® foundation for stronger soybeans

Nadine Loubser
MBFi

MBFi
Leaders in Science. Partners in Growth.



NITROLOGY® RANGE

Nitrology®: World-class Rhizobium technology for legumes

Soybeans depend on a successful partnership with *Bradyrhizobium japonicum* to convert atmospheric nitrogen into plant-available nitrogen through biological nitrogen fixation. This process takes place inside root nodules and can supply a major portion of the crop's nitrogen requirement. However, effective nodulation depends on more than simply applying bacteria to seed.

Rhizobial survival, compatibility with seed treatments, early root colonisation and stress tolerance all influence field performance.

The Nitrology® range brings together a portfolio of rhizobial inoculants and support technologies designed to meet different soybean production needs. At the core of the range is the delivery and protection of *B. japonicum*, the bacterium responsible for effective nodulation and biological nitrogen fixation in soybean.

For more specialised production requirements, the range includes differentiated technologies that support rhizobial performance in harsher planting environments.

Technologies present in the Nitrology® range, include:

Nitro-Liq® Soybean provides a premium liquid inoculant option, supported by Premium *Rhizobium* Liquid technology, and is focused on strong rhizobial delivery and reliable nodulation.

Rizo-Liq® Soybean offers advanced liquid inoculation supported by OSMO Protection®, which helps maintain bacterial survival and improves on-seed performance under stressful conditions.

Rizogen® Soybean combines OSMO Protection® with EXO Activation®, supporting bacterial resilience while enhancing early root interaction and nodulation potential.

Signum® Soybean combines OSMO Protection® with Signal Generation, designed to encourage faster interaction between soybean roots and rhizobia, particularly where early establishment may be challenged.

Elite® Soybean inoculant contains Membrane Protection, which helps protect bacterial cells against seed-applied stress factors and supports extended on-seed survival.

Bio-Shield® XT completes the system by improving compatibility and protecting inoculant survival where seed treatments, storage periods, or environmental stress may reduce viable rhizobial numbers.

NITROLOGY® RANGE

ADVANCED SOYBEAN INOCULANT TECHNOLOGY



Together, the Nitrology® range provides growers with flexible inoculation options, allowing the correct technology to be matched to the required planting window, seed-treatment programme and field conditions.

Importantly, these products are not identical. The technologies behind the inoculants differ, allowing producers to select the best fit depending on planting conditions, seed-treatment requirements, pre-treatment windows and desired level of protection. >>





Trillum®: Green Chemistry® protection for the root zone

Trillum® contains *Trichoderma asperellum*, a beneficial fungal active used to protect the crop against important soil-borne diseases such as *Pythium*, *Fusarium* and *Rhizoctonia*. These pathogens attack young roots and seedlings, reducing early vigour, root mass and establishment. By supporting a healthier root environment, Trillum® helps protect the crop during one of the most vulnerable stages of development.

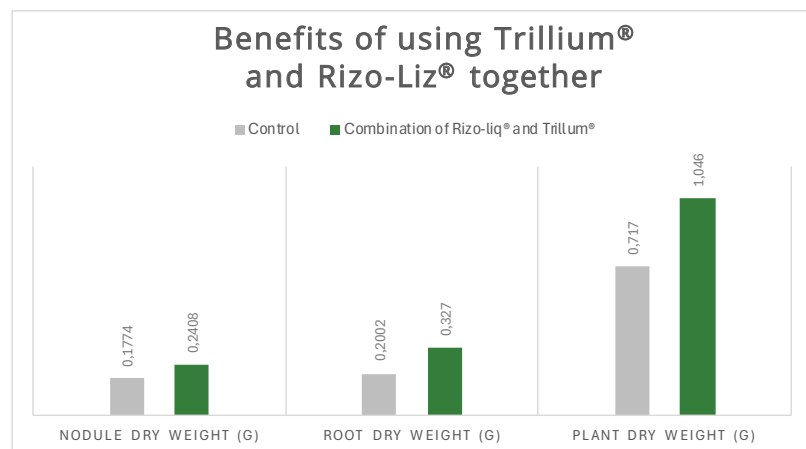
Rather than positioning Trillum® only as a biological control product, it should be viewed as part of a Green Chemistry® root-protection strategy. It works in the root zone where disease pressure, moisture fluctuations and seedling stress intersect. This makes it especially valuable in programmes where early root protection and crop establishment are key objectives.

Synergy between Trillum® and Nitrology®
A strong soybean crop needs both healthy roots and functional nodules. This is where the combination of Trillum® and Nitrology® becomes important.

Bradyrhizobium supports nitrogen fixation, but it depends on an actively growing root system to form nodules and supply the plant with nitrogen. Trillum® supports this by helping protect the young root system from soil-borne disease pressure. When root stress is reduced, the plant is better positioned to develop a larger, healthier root system and support stronger nodulation.

MBFi's foundation packs give growers the flexibility to choose the most suitable approach for their production system, whether the programme requires seed application, in-furrow application, or a combined strategy.

These packs combine products from the Nitrology® range with Trillum® from MBFi's Green Chemistry® range, bringing together advanced rhizobial inoculation technology and root-zone disease protection in one integrated foundation programme.



Benefits of using Trillum® and Rizo-Liz® together.

This flexibility is important because farms differ in planting equipment, soil conditions, biological activity, disease pressure and planting practices. By selecting the correct foundation pack, growers can match the technology to their specific field requirements and support optimum crop establishment.

Soybean plant trial results

The soybean trial compared a standard Rizo-Liz® seed treatment as the control against a combined Rizo-Liz® + Trillum® seed treatment to determine the effect of adding root-zone support to the inoculation programme. Clear differences were observed in root and plant development.

The combined Rizo-Liz® + Trillum® treatment produced higher nodule dry weight, root dry weight and plant dry weight compared with the Rizo-Liz® control. This indicates that the addition of Trillum® provided complementary root-zone support, helping create a healthier root environment for improved nodulation and early plant growth.

This is important because stronger root systems support nutrient uptake, water absorption and nodule development, all of which contribute to early soybean vigour. These results support the value of combining effective rhizobial inoculation technology with Green Chemistry® root protection to strengthen early soybean establishment.

Conclusion

Trillum® and the Nitrology® range work together as a foundation platform for soybean establishment. Nitrology® focuses on world-class rhizobial inoculation and nitrogen fixation, while Trillum® supports root-zone protection through Green Chemistry® against soil-borne disease pressure. When used strategically, these technologies help create the conditions needed for stronger roots, improved nodulation and better early plant growth.



Nitro-Liq Soybean® Reg. no. L8986 Act 36 of 1947 | A.I.: *Bradyrhizobium japonicum* 2×10^9 CfU/mL
 Rizo-Liq Soybean® Reg. no. L8738 Act 36 of 1947 | A.I.: *Bradyrhizobium japonicum* 6.5×10^9 CfU/mL
 Signum Soybean® Reg. no. L8988 Act 36 of 1947 | A.I.: *Bradyrhizobium japonicum* 6.5×10^9 CfU/mL
 Elite Soybean Inoculant® Reg. no. L8925 Act 36 of 1947 | A.I.: *Bradyrhizobium japonicum* 1×10^{10} CfU/mL
 Rizogen® Soybean Reg. no. L10801 | A.I.: *Bradyrhizobium japonicum* 6.5×10^9 CfU/mL
 Trillum® Wp Reg. no. L 11032 Act No. 36 of 1947 | A.I.: *Trichoderma asperellum* 2×10^9 Spores/g
 Trillum® Ds Reg. no. L10241 Act No. 36 of 1947 | A.I.: *Trichoderma asperellum* 2×10^9 Spores/g

Registration holder: MBFi (Pty) Ltd. Marketed and Distributed by MBFi (Pty) Ltd.



START TECHNOVATION™: Wetenskaplike presisie om invoor-strategie te bemeester

Nuwe inisiatief, nuwe fokus

In die moderne hoë-opbrengs omgewing is die marge vir foute weglaatbaar klein. Die verskil tussen 'n rekord-oes en 'n gemiddelde opbrengs word dikwels reeds binne die eerste 21 dae na plant bepaal. Terwyl die meeste produsente op seisoenale bemestingsplanne fokus, is daar nou 'n alternatiewe benadering waar die fokus verskuif na die mees kritieke fase op plaasvlak, naamlik die plantvoor.

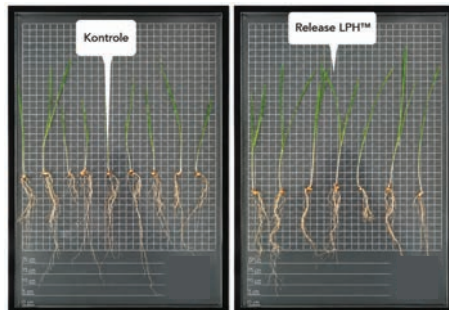
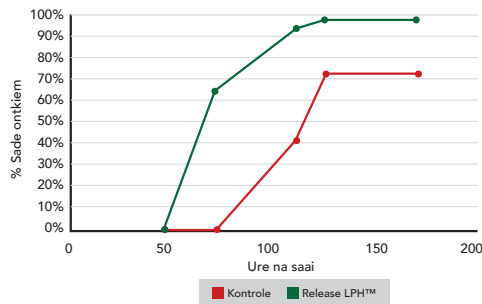
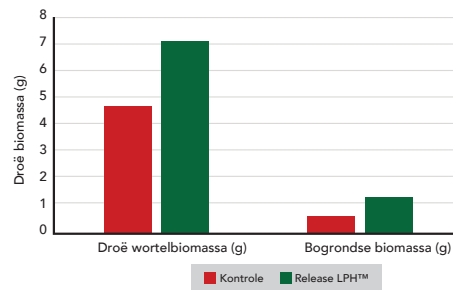
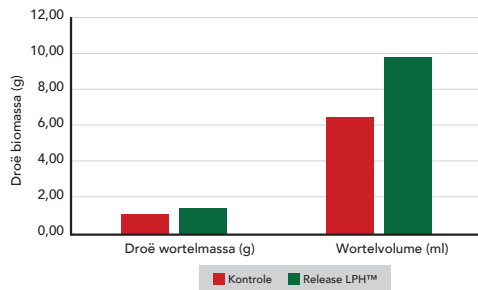
Die nuwe START TECHNOVATION™-inisiatief bied produsente 'n wetenskap-gebaseerde bloudruk vir gewasvestiging wat die grense van konvensionele voeding oorskry.

Een van die hoekstene van die START TECHNOVATION™-benadering is RELEASE LPH™ (Reg. nr. M441, Wet 36 van 1947).

Die wortelzone: Chemiese stabilisering vir 'n sterk begin

Die direkte omgewing rondom die jong wortel (die rhizosfeer) is 'n uitdagende ruimte vir 'n ontkiemende saad. Navorsing toon dat vroeë wortelontwikkeling gestrem word deur chemiese beperkings soos hoë soutkonsentrasies en pH-skommelings, wat osmotiese stres veroorsaak.

1. Koring invoor-behandeling (Figuur 1)

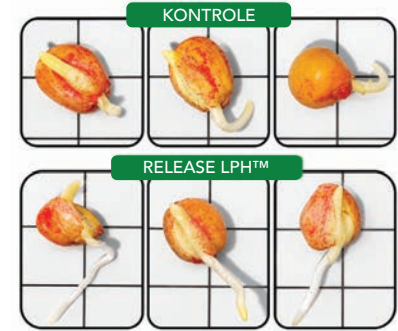
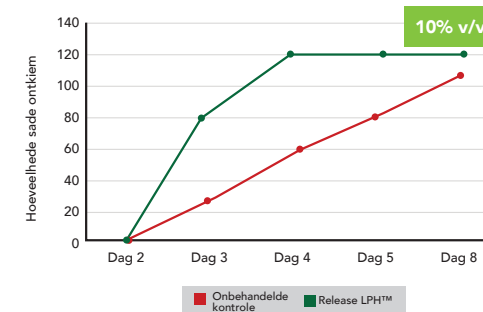


Figuur 1: Resultate behaal met RELEASE LPH™ op koring (data verskaf deur Agri Technovation).

Janneman Cornelius
Kommersiële & Tegniese Hoof: Grane, Industriële Gewasse
en Aartappels (Produkte en Dienste), Agri Technovation



2. Mielies invoor-behandeling



Figuur 2: Resultate behaal met RELEASE LPH™ op mielies (data verskaf deur Agri Technovation).

Hierdie faktore belemmer die saailing se vermoë om water en minerale effektief op te neem, wat dikwels lei tot die verskynsel van oneweredige opkoms en groei.

RELEASE LPH™ is 'n hoogs-gekonsentreerde grond- en wortelkondisioneerder. Hierdie gespesialiseerde fulviensuurmengsel is uniek vanweë hul lae molekulêre gewig en hoë biologiese aktiwiteit. In die plantvoor tree organiese sure op as kragtige organiese elektroliete en chelermiddels.

Dit bind aan metaal-ione en maak voedingstowwe soos fosfaat en kalium (wat dikwels in die grondprofiel vasgelê word) onmiddellik toeganklik vir die jong wortelstelsel (Canellas et al., 2015).

Deur die rhizosfeer chemies te stabiliseer (te buffer), word die metaboliese energie wat die plant benodig vir mineraalopname verminder, wat die saailing toelaat om daardie energie eerder in vroeë vegetatiewe groei te belê.

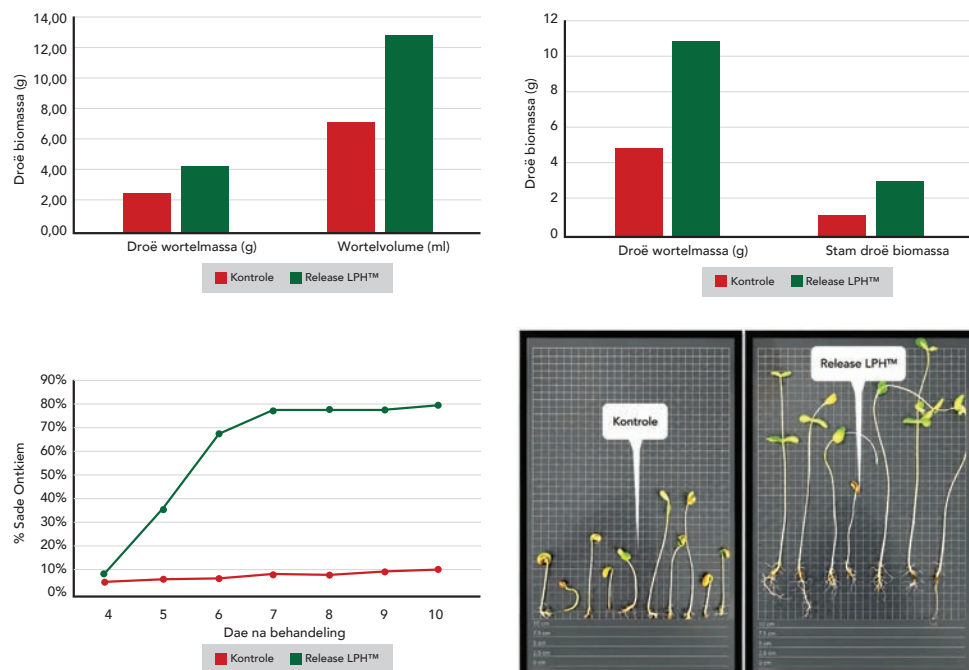
Fisiologiese versterking ("priming") en die pad na eenvormige plantestand

Vanuit 'n gewas-fisiologiese perspektief, is die mees kwesbare tydperk in die lewensiklus die oorgang van 'n heterotrofiese saailing (maak staat op saadreserwes) na 'n outotrofiese plant (produseer self energie deur fotosintese). In rygewasse soos mielies, sonneblomme, grondbone en sojabone, is die V3 tot V4-fases deurslaggewend.

By mielies word die aantal pitte per ry en die potensiële kopgrootte reeds gedurende hierdie venster bepaal (Ritchie et al., 1993). >>



3. Sojaboon invoer-behandelings



Figuur 3: Resultate behaal met RELEASE LPH™ op sojabone (Data verskaf deur Agri Technovation).

RELEASE LPH™ gebruik die bio-aktiewe krag van die fulviensuurmengsel om hierdie oorgangsfase te ondersteun deur die chemiese mikro-omgewing rondom die saad te stabiliseer en dit homogeen te maak.

Die ware krag van hierdie formulasie lê in die vermoë om abiotiese stresfaktore in die plantvoor, te verminder (Canellas et al., 2015), (Nardi et al., 2002). Die fulviensure in RELEASE

LPH™ kan wortelontwikkeling, voedingsstofopname en plantfisiologiese aktiwiteit stimuleer, wat vroeë vestiging van saailinge kan bevorder. (Varanini & Pinton, 2001).

Die krag van pasmaak-voeding en strategiese kundigheid

Die START TECHNOVATION™-benadering erken dat grondbiologie en -chemie dinamies is en ook dat dit van plaas tot plaas verskil.



Om hierdie rede word invoer-toediening nie as generiese resep nie, maar eerder as komponent van 'n pasmaak oplossing beskou. Die kommersiële strategie wat gevolg word is gebou op die integrasie van presiesedata met praktiese agronomiese oplossings.

Die spesifieke behoeftes van elke plaas word bepaal deur kundiges deur middel van gevorderde grond- en blaarontledings. Met hierdie data/resultate is dit moontlik om RELEASE LPH™ strategies te kombineer met ander gepaste produkte soos mikro-elementmengsels of biologiese stimulanse, om 'n program saam te stel wat spesifiek op die produsent se behoeftes gerig is.

Die ekonomiese oogpunt is duidelik: die maksimering van die opbrengs op belegging (OOB) deur 'n eenvormige plantestand te verseker. 'n Land wat gelyktydig opkom is makliker (dus meer ekonomies) om te bestuur ten opsigte van onkruidbeheer en plaagbestuur, wat uiteindelik lei tot optimale oes-sinkronisasie.

'n Nuwe era deur START TECHNOVATION™

START TECHNOVATION™ is die resultaat van jare se navorsing en die praktiese toepassing van grondkunde en plantfisiologie op die hoogste vlak. Die primêre fokus is dus nie die gebruik (en dus die verkoop) van 'n sekere produk nie maar eerder die verskaffing van 'n wetenskaplike voorsprong aan die produsent. Of dit nou gaan oor die vinnige vorming van die blaredak in sojabone of die ontwikkeling van 'n kragtige wortelstelsel in aartappels, die beginsels van invoer-bestuur bly dieselfde.

Deur die chemiese omgewing te optimaliseer en die saailing se metaboliese prosesse vroeëtydig te aktiveer, word 'n platform vir volhoubare sukses geskep.

Sukses begin in die plantvoor

Die pad na 'n rekord-oes begin nie by die stroper nie, maar by die planter. Deur RELEASE LPH™ as een van die hoekstene van 'n bepaalde invoer-strategie te gebruik, neem die produsent vanaf dag een beheer oor die gewas se uiteinde.

Skakel gerus vir Agri Technovation of jou naaste LAC-agent vir verdere inligting. Kundiges staan gereed om jou te ondersteun met die tegnologie, die data en die kundigheid om jou boerdery na die volgende vlak van produktiwiteit te neem. Begin reg. Begin met presisie. START TECHNOVATION™.

Verwysings:

- Canellas, L.P., Olivares, F.L., Aguiar, N.O., Jones, D.L., Nebbioso, A., Mazzei, P. & Piccolo, A. 2015. *Humic and fulvic acids as biostimulants in horticulture*. Scientia Horticulturae, 196: 15-27. <https://doi.org/10.1016/j.scienta.2015.09.013>.
- Ritchie, S.W., Hanway, J.J. & Benson, G.O. 1993. *How a corn plant develops*. Special Report No. 48. Iowa State University of Science and Technology, Cooperative Extension Service, Ames, Iowa.

- Varanini, G. & Pinton, R. 2001. *Direct effects of humic substances on plant growth and root functioning*. In: Pinton, R., Varanini, G. & Nannipieri, P. (eds). *The Rhizosphere: Biochemistry and Organic Substances at the Soil-Plant Interface*. Marcel Dekker, New York. pp. 427-453.
- Zandonadi, D.B., Santos, M.P., Dobbss, L.B., Olivares, F.L., Canellas, L.P., Binzel, M.L., Okorokova-Façanha, A.L. & Façanha, A.R. 2010. *Nitric oxide mediates humic acids-induced root development*. Plant Physiology, 153(2): 811-821.
- Nardi, S., Pizzeghello, D., Muscolo, A. & Vianello, A. (2002). *Physiological effects of humic substances on higher plants*. Soil Biology & Biochemistry, 34, 1527-1536.

Where innovation meets exceptional insect control

Reshma Gayaram
Marketing Lead Africa, FMC

FMC | An Agricultural Sciences Company



Harnessing world-class scientific excellence, FMC sets the benchmark in global research and innovation by delivering breakthrough new solutions for superior insect control. Circaden® Insecticide, powered by Cyazypyr®, is a revolutionary product that provides early-season insect protection whilst delivering complete plant health from seed to harvest.

It creates a unique action against a wide spectrum of sucking and chewing pests for a more resilient crop. Applications early in the crop cycle can help protect tender seedlings from certain insect-borne diseases, especially when used as part of an integrated pest management programme.

Circaden® Insecticide, known as a high-impact solution from FMC, offers broad-spectrum control against harmful insects such as whitefly, aphids, thrips, leaf miners and *Lepidoptera*, whilst improving crop establishment in crops such as tomato, sweet peppers and cabbage during early-season soil application.

Also referred to as cyantraniliprole (Cyazypyr®), which is renowned for its advanced performance and reliability, Circaden® Insecticide belongs to the Group 28, anthranilic diamide class. The Circaden® Insecticide formulation is designed for maximum movement and uptake through the root system, thus enhancing the product's ability to control a wide range of pests at different life stages. The insecticide binds to ryanodine receptors, which can be found on the sarcoplasmic reticulum of the insect muscle. The activation of those receptors causes the release and depletion of intracellular calcium, leading to muscle contraction and paralysis.

Symptoms include rapid cessation of feeding, general lethargy, paralysis and eventual pest death. Apart from providing high-quality products, FMC also invests in stewardship, promotes sustainable agricultural practices and ensures product safety.

In line with this commitment, Circaden® Insecticide has an excellent ecotoxicology and environmental profile and allows selective control of pests, whilst preserving beneficial arthropods.

Key benefits of Circaden® Insecticide

- **Dual-route activity:** Circaden® Insecticide works primarily through ingestion, with additional control through contact with Cyazypyr®.
- **Protects crops:** Helps prevent foliar injury and fruit damage caused by insect pests. Reduces disease risk: Assists in limiting the transmission of certain insect-vectored viruses.
- **Controls prolific pests:** Effective against a range of highly reproductive pest species.
- **Long-lasting protection:** Provides extended residual activity for sustained pest control.
- **Unique mode of action:** Cyazypyr® affects insect muscle function, leading to rapid feeding cessation.
- **Excellent plant protection:** Stops pest feeding quickly, reducing crop damage even before insect death occurs.
- **Supports IPM programmes:** Features a favourable environmental profile and is compatible with Integrated Pest Management (IPM) strategies.

To find out more about how Circaden® Insecticide insect control can increase the vigour of your crops for stronger, healthier plants with better quality and higher yields, visit the FMC website at www.ag.fmc.com/za/en or contact your nearest FMC area manager.



Circaden® Insecticide, Reg. no. L11488, Act no. 36 of 1947, contains *cyantraniliprole* (anthranilic diamide) – 200 g/l (Cyazypyr). Warning: harmful if inhaled, very toxic to aquatic life with long-lasting effects.

FMC Chemicals (Pty) Ltd, PO Box 44, Postnet Menlyn, Waterkloof Glen, 0181, South Africa. Circaden® Insecticide and Cyazypyr® are trademarks of FMC Corporation or its affiliates.

Beyond application: Activating calcium utilisation with KELPURA™

KELPURA™ (Fertiliser Group 3, M442) is a concentrated kelp-derived biostimulant from *Ecklonia maxima*, produced through a low-temperature extraction process to retain its full spectrum of bioactive compounds.

These include phytohormones, phenolic acids, salicylic and benzoic acid-related compounds, and amino acids, all of which act together to improve the plant's ability to absorb, transport and structurally utilise foliar-applied calcium during reproductive development. In calcium programmes, particularly in combination with CALCINATOR™ (Fertiliser Group 2, B5022), KELPURA™ functions as the physiological driver that determines whether applied calcium becomes functionally integrated into plant tissues.

The effectiveness of this system is defined by how KELPURA™ interacts with the plant processes that normally limit calcium utilisation (Figure 1). Calcium is essential for cell wall stabilisation, membrane integrity and reproductive development, yet it is inherently immobile within the plant and cannot be redistributed to actively growing tissues such as flowers and fruit (White & Broadley, 2003; Marschner, 2012).

As a result, these tissues depend on continuous external supply through foliar application.

However, applied calcium only becomes functional if it remains mobile, reaches developing tissues, and is incorporated into the cell wall. KELPURA™ improves this efficiency by acting directly on each of these steps through its integrated biochemical composition.

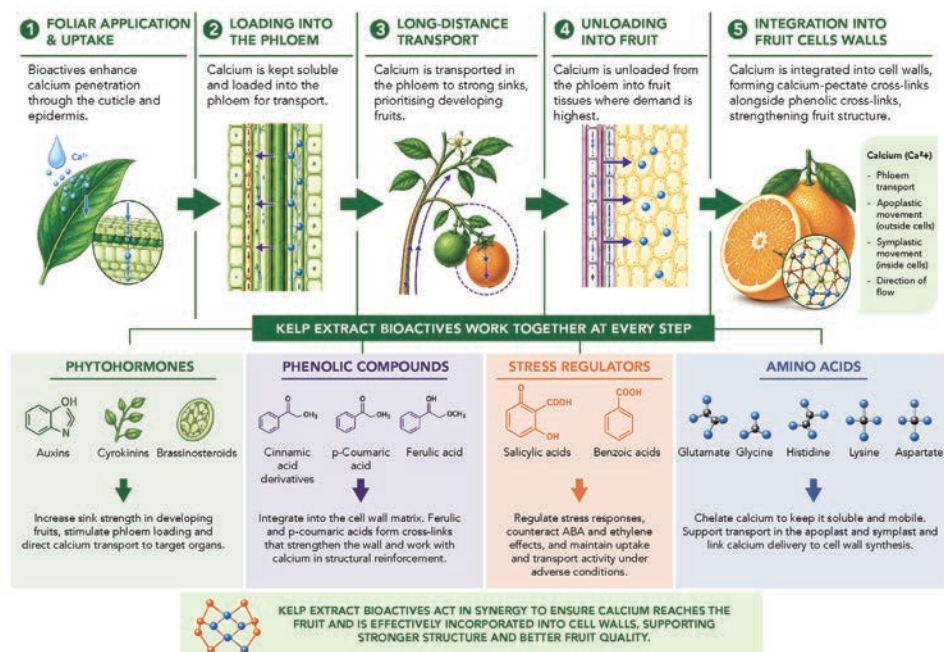


Figure 1: Mode of action of KELPURA™ on calcium uptake and utilisation.

Rochelle Thuynsma
Head of Products: Technical, Agri Technovation

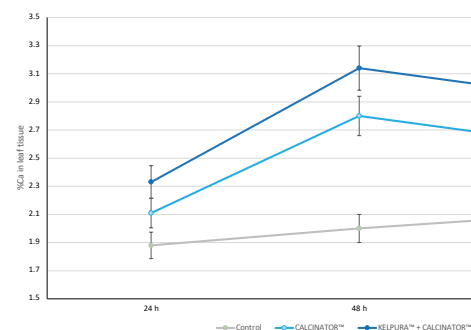


Figure 2: Calcium concentration (% Ca in leaf tissue) over time following foliar application of CALCINATOR™ (1 L/100 L), and KELPURA™ (500 ml/100 L).

Driving calcium efficiency with KELPURA™
This effect is reflected in calcium uptake dynamics following foliar application.

Across measured time points, the combination of KELPURA™ with CALCINATOR™ resulted in consistently higher calcium accumulation in leaf tissue, when compared to both the untreated control and CALCINATOR™ alone (Figure 2). Calcium levels increased rapidly following application, reaching a higher peak and remaining elevated, relative to other treatments. In contrast, the control showed limited calcium accumulation, while CALCINATOR™ alone improved uptake but did not achieve the same magnitude or consistency as the combined treatment.

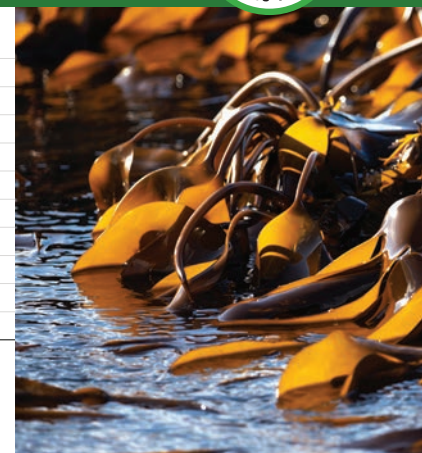
These differences were maintained over time and translated into final calcium status. After 72 hours, the increase in leaf calcium was greatest where KELPURA™ was included with CALCINATOR™, confirming that calcium efficiency is determined not only by supply, but by the plant's ability to absorb, transport and utilise that supply effectively (Figures 2).

The phenolic fraction of KELPURA™, including cinnamic acid derivatives such as *p*-coumaric and ferulic acid, interacts directly with the structural environment of the cell wall.

These compounds are part of the same biochemical system that governs cell wall reinforcement, where ferulic acid forms cross-links between polysaccharides and lignin-associated structures, increasing rigidity and defining wall permeability (Fry, 1986; Boerjan et al., 2003; Ralph et al., 2004).

Within this context, calcium movement is not independent of the wall structure; it is influenced by the degree of cross-linking and the resulting restriction of apoplastic transport. By supplying phenolic compounds, KELPURA™ operates within this system, supporting the incorporation of calcium into a structurally reinforced matrix, rather than allowing it to be excluded by reduced permeability.

This structural interaction is reinforced by the phytohormonal activity of KELPURA™, where auxins, cytokinins and brassinosteroids regulate growth, sink strength and membrane function. These hormones increase the demand for calcium in developing tissues while improving directional movement toward these sites, ensuring that calcium reaches areas where phenolic-mediated structural reinforcement is actively occurring (Davies, 2010; Vrijet et al., 2012). In this way, KELPURA™ aligns calcium delivery with the plant's structural development processes. >>



At the same time, Kelpura™ maintains the physiological conditions required for calcium uptake under stress. During reproductive development, elevated abscisic acid and ethylene activity can suppress growth and reduce nutrient uptake, limiting calcium movement. The salicylic acid content of Kelpura™ regulates stress responses and supports continued metabolic activity, ensuring that calcium uptake and transport processes remain active.

Benzoic acid contributes to this system through its role in metabolic pathways associated with salicylic acid and cytokinin activity, reinforcing the plant's ability to maintain calcium utilisation under adverse conditions (Hayat et al., 2010; Khan et al., 2015).

The amino acid fraction of Kelpura™ further supports calcium efficiency by maintaining calcium in a mobile and plant-available form during foliar uptake and transport. Amino acids such as glutamate, glycine, histidine and lysine facilitate calcium movement across the leaf surface and within the apoplast, while glutamate and aspartate support internal transport.

Serine contributes to cell wall synthesis, linking calcium delivery directly to structural incorporation. This ensures that calcium remains available long enough to reach developing tissues and be integrated into the cell wall alongside phenolic components (Fernández & Eichert, 2009).



Conclusion

KELPURA™ determines the efficiency of calcium utilisation by driving the absorption, transport and structural incorporation of calcium within the plant. Through its integrated biochemical composition, it ensures that calcium is not merely present, but also functionally embedded within a phenolic-reinforced cell wall system where calcium-pectate stabilisation and cross-linking operate together.

When used in combination with CALCINATOR™, Kelpura™ further enhances the effectiveness of applied calcium, ensuring that supply is translated into functional structural integration during critical developmental stages.

References:

1. Boerjan, W., Ralph, J., & Baucher, M. (2003). *Lignin biosynthesis*. Annual Review of Plant Biology, 54, 519–546.
2. Davies, P. J. (2010). *Plant Hormones: Biosynthesis, Signal Transduction, Action!* Springer.
3. Fernández, V., & Eichert, T. (2009). *Uptake of hydrophilic solutes through plant leaves*. Critical Reviews in Plant Sciences, 28, 36–68.
4. Fry, S. C. (1986). *Cross-linking of matrix polymers in plant cell walls*. Annual Review of Plant Physiology, 37, 165–186.
5. Hayat, S. et al. (2010). *Salicylic acid and plant stress tolerance*. Plant Signalling & Behavior
6. He, S.Y., Huang, H.C. & Collmer, A. (1993). *Pseudomonas syringae pv. syringae harpinPss: a protein that is secreted via the Hrp pathway and elicits the hypersensitive response in plants*. Cell, 73, 1255–1266.
7. Hepler, P. K. (2005). *Calcium regulation in plant development*. The Plant Cell, 17, 2142–2155.
8. Khan, M. I. R. et al. (2015). *Salicylic acid-induced stress tolerance*. Frontiers in Plant Science, 6, 462.
9. Lee, J., Klessig, D.F. & Nürnberger, T. (2001). *A harpin binding site in tobacco plasma membranes mediates activation of the pathogenesis-related gene expression and ion fluxes*. The Plant Cell, 13, 1079–1093.
10. Marschner, P. (2012). *Mineral Nutrition of Higher Plants*. Academic Press.
11. Ralph, J. et al. (2004). *Lignin structure and formation*. Phytochemistry Reviews, 3, 29–60.
12. Taiz, L. et al. (2015). *Plant Physiology and Development*. Sinauer.
13. Vriet, C. et al. (2012). *Brassinosteroids in crop performance*. The Plant Cell, 24, 842–857.
14. Wei, Z.M., Laby, R.J., Zumoff, C.H., Bauer, D.W., He, S.Y., Collmer, A. & Beer, S.V. (1992). *Harpin, elicitor of the hypersensitive response produced by the plant pathogen Erwinia amylovora*. Science, 257, 85–88.

Wen teen bosindringing

Met Sendero® 336 SL



Sendero® is uiters doeltreffend om teikenspesies soos Sekelbos te beheer. Terselfdertyd het dit geen nadelige impak op gevestigde of ontkiemende grasse nie. Ander voordelige boom- en struikspesies word nie beskadig nie.



PRODUKEIENSKAPPE

- Sendero® 336 SL is doeltreffend d.m.v. lugbespuiting oor groter areas of rugsakbespuiting vir kolbehandelings.
- Sendero® 336 SL kan in kombinasie met ander produkte ook 'n wyer spektrum van spesies soos Soetdoring, Prosopis en Swarthaak beheer.
- Die produk is veilig vir mens en dier, en vee of wild hoef nie voor behandeling geskuif te word nie.

Die Terravusa-span is spesialiste in die bestuur van verdigte bome en struie in natuurlike weidings. Ons gebruik ons kundigheid en unieke reeks produkte om die regte aanbeveling vir 'n boer op sy plaas te maak.

Só kry die boer die optimale weiding en produktiwiteit uit elke hektaar.



Die aktiewe bestanddele is nie skadelik vir wild, vee, voëls of enige ander boslewe nie.



Nuwe weidinggras keer terug na die Sendero®-toediening.

**Sendero®
336 SL**

HERBICIDE

Gebruik altyd volgens die aanwysings op die produkietiket.

Sendero® 336 SL bevat aminopiralië en klopiralië. Reg. nr. L10569, Wet nr. 36 van 1947. Reg. houer: Corteva Agriscience RSA (Edms.) Bpk. Reg. nr. 1991/003030/07. Lakefield Office Park, Weslaan 272, Centurion, 0157, Suid-Afrika.

**NAVRAE &
BESTELLINGS**

**Stephan Jooste
Malcolm Vermeulen**

**T: 072 275 7160 / E: stephan@terravusa.com
T: 066 297 5055 / E: malcolm@terravusa.com**

www.terravusa.com

Peste kan 'n "beach" wees... maar beheer moet presies wees

envirobiochem.co.za

enviro
bio-chem

Onder Suid-Afrikaanse toestande, waar temperature en seisoene dikwels ideaal is vir vinnige plaagontwikkeling, bly Lepidoptera-larwes een van die grootste oorsake van opbrengsverliese in rygewasse, groente en boomgewasse. Spesies soos herfs-kommandowurm, bolwurms en ander ruspes kan binne 'n kort tyd groot skade aanrig en gewasontwikkeling ernstig benadeel.

Doeltreffende beheer vereis daarom meer as net tydig toediening, dit vra ook produkte met betroubare werking en eienskappe wat pas by moderne produksiestelsels.

Die biologie van die probleem

Lepidoptera-larwes bied unieke uitdagings vir beheer:

- Hulle voed aktief en veroorsaak direkte skade aan blare en reprodutiewe strukture.
- Hulle kom dikwels voor in beskermde groeipunte of digte blaarmassas.
- Baie populasies toon reeds verminderde sensitiwiteit teenoor konvensionele chemiese groepe.

Hierdie eienskappe beklemtoon die behoefte aan produkte wat deur die plant opgeneem word om tydens voeding deur die plaag ingeneem te kan word.



Tarpinon – 'n doelgerigte benadering tot larwale beheer

Tarpinon 50 WG bevat emamektien bensoaad (IRAC Groep 6) en is geformuleer as 'n wateroplosbare korrel vir die beheer van Lepidoptera-larwes.

Die produk het translaminêre eienskappe, wat beteken dit beweeg deur die blaaroppervlak en versprei binne die blaarweefsel.

Dit verseker dat die aktiewe bestanddeel beskikbaar is waar larwes voed, en bevorder konsekwente opname tydens voedingsaktiwiteit.

Belangrike eienskappe

- Translaminêre beweging tot binne in blaarweefsel.
- Werking deur maagaksie.
- Teiken die insek se senuweestelsel.
- Geskik vir programme waar betroubare larwale beheer nodig is.

Hierdie werkswyse ontwig die normale werking van larwes se senuweestelsels, wat hulle vermoë om te voed en te ontwikkel beperk.

Rol in weerstandsbestuur

Weerstand teen insekdoders is 'n toenemende realiteit in Suid-Afrika, en dit maak die keuse van produkte al hoe belangriker.

Tarpinon bied waarde in weerstandsbestuur omdat dit:

- 'n Alternatiewe chemiese groep bied vir die beheer van Lepidoptera-pestes (IRAC Groep 6 - Avermektien); en
- Effektief bly teen populasies wat weerstand opgebou het teen Karbamate (IRAC Groep 1A), Organofosfate (IRAC Groep 1B) en Piretroïede (IRAC Groep 3).

Die gebruik van Tarpinon 50 WG as deel van 'n rotasieprogram help daarom om die volhoubaarheid van chemiese beheer te beskerm.



Gevolgtrekking

Peste kan maklik 'n "beach" wees – frustrerend, onvoorspelbaar en duur. Maar met die regte gereedskap en strategie hoef dit nie so te bly nie.

Tarpinon 50 WG bied:

- 'n Betroubare oplossing vir Lepidoptera-beheer.
- 'n Belangrike hulpmiddel in weerstandsbestuur.
- Konsekwente beheer oor verskillende gewasse en toestande.

Die gevolg is dat jy minder tyd spandeer om peste te bestuur... en meer tyd kan hê om te droom oor daardie Mauritius-vakansie.

Praktiese toepassing in die veld

Die suksesvolle gebruik van Tarpinon hang grootliks af van tydsberekening en goeie toedieningspraktyke.

Tydsberekening

Die beste resultate word verkry wanneer toediening plaasvind:

- op vroeë larfstadiums (L1-L2);
- tydens aktiewe voeding; en
- voor betekenisvolle gewasskade ontwikkel.

Vroeë beheer help om plaagpopulasies te stabiliseer en om die ontwikkeling van verdere generasies te beperk.

Sputpraktiek

Doeltreffende toedieningspraktyke bly krities:

- Gebruik voldoende watervolumes vir egalige bedekking.
- Verseker penetrasie in digte blaarmassas.
- Pas waterkwaliteit (pH/hardheid) aan waar nodig.

Programplasing en weerstandsbestuur

Tarpinon moet strategies gebruik word:

- Wissel toedienings af met produkte uit ander IRAC-groepe.
- Verminder herhaalde toedienings met Groep 6-produkte.
- Moet nie Tarpinon saam met abamektien-gebaseerde produkte gebruik nie.

TARPINON 50 WG – Reg. nr. L11338, Wet 36 van 1947. Aktiewe bestanddeel: Emamektien bensoaad – 50 g/kg. IRAC INSEKODER GROEPCODE: 6. Registrasiehouer: Enviro Bio-Chem (Pty) Ltd. Maatskappy Reg. nr. CK2013/194774/07. T: 012 006 0063 | 072 678 8226. E: robby@envirobiochem.co.za.

Ammoniumsulfaat: Steeds die voorkeursoutbyvoegmiddel

Brian de Villiers
Villa

villa



Die pH, bufferkapasiteit en opgeloste katione van spuitwater speel 'n groot rol met sekere gewasbeskermingsprodukte (GBP'e). pH en bufferkapasiteit is belangrik vir sekere onkruidodders wat deur alkaliese hidrolise benadeel word. pH speel egter ook 'n rol in die opname en effektiwiteit van verskeie GBP'e.

Opgeloste katione benadeel weer die effektiwiteit van verskeie na-opkoms onkruidodders. Indien opgeloste katione nie aangespreek word nie, sal die onkruidodders nie optimaal opgeneem word nie, en die onkruidbeheer sal benadeel word.

Waarom is opgeloste katione in spuitwater so gevaarlik?

Waterbronne bevat altyd 'n sekere hoeveelheid kalsium, magnesium, natrium en kalium. Hardewater bevat byvoorbeeld hoë vlakke kalsium en magnesium, waar brakwater weer hoë vlakke natrium bevat. Hierdie vier katione, asook sekere swaarmetale soos yster, bind aan sekere onkruidodders tydens druppeluitdroging op die blaar en vorm onopneembare verbindings in die druppelresidu.

Sodoende word opnamehoeveelheid en -tempo van die onkruidoder beperk en daarom word onkruidbeheer verswak.

Divalente katione soos kalsium (Ca^{2+}) en magnesium (Mg^{2+}) is meer antagonisties as monovalente katione soos natrium (Na^{+}) en kalium (K^{+}), omdat dit op meer bindingsplekke van die onkruidoddermolekuul kan heg. Die reaksie kan byvoorbeeld 'n onkruidoddermolekuul soos glifosaat totaal misvorm (Figuur 1), die druppelresidu verander (Foto's 1 & 2), en die opname belemmer.

Verskeie onkruidodders word deur opgeloste katione in spuitwater benadeel, maar die bekendste produkte is glifosaat, kletodim, seker sulfonielureums, sekere hormoonodders en verskeie ander.

Alhoewel natrium, wat 'n monovalente kation is, heelwat minder antagonisties as kalsium en magnesium is, kom dit dikwels teen geweldige hoë vlakke in sekere dele van Suid-Afrika voor. Daarom is dit net so 'n belangrike antagonistiese kation.

Die rede waarom ammoniumsulfaat so 'n suksesvolle byvoegmiddel is

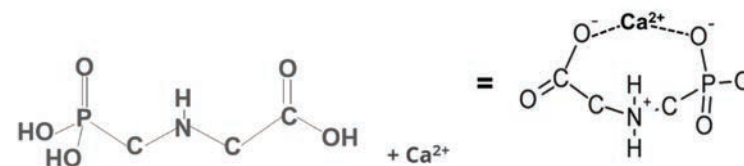
Ammoniumsulfaat word al vir meer as 40 jaar gebruik om die antagonisme van al vier hierdie katione aan te spreek. Dit werk nie in die tenk terwyl alles in oplossing is nie, maar eerder op die onkruidblaar terwyl die spuitdruppel uitdroog. In plaas daarvan dat die kation aan die onkruidoder bind, dit misvorm en die opname belemmer, bind dit eerder aan die sulfaatkation.

Dit kan duidelik in Foto 3 gesien word, waar die stervormige kalsiumsulfaatkristalle aan die onderkant van die spuitdruppelresidu duidelik sigbaar is. Hierdie reaksie is 'n volledige, onomkeerbare proses.

Dus, as die korrekte dosis ammoniumsulfaat gebruik word, sal al vier hierdie katione permanent geneutraliseer word. Dit is belangrik om te besef dat hierdie reaksie tydens druppeluitdroging plaasvind, en nie in die spuittenk nie. Daarom is dit nie nodig om te wag dat ammoniumsulfaat eers die water "behandel" nie.

Dit is egter nie net die sulfaatkation wat belangrik is nie. Nadat die antagonistiese katione op die onkruidblaar gebind word, speel die ammoniumkation 'n onmisbare rol in die opnameproses. Beide die anioon en kation van ammoniumsulfaat het dus 'n kritiese funksie om die opname en effektiwiteit van hierdie onkruidodders te verseker.

Dit is belangrik om te noem dat net byvoegmiddel-graad ammoniumsulfaat geskik is vir hierdie doel. Die kunsmis-graad produk voldoen nie aan die vereistes vir 'n byvoegmiddel nie, en moet onder geen omstandighede gebruik word nie. Die produk moet dus 'n L-nummer as bewys van registrasie hê.



Figuur 1: Die kompleksing van 'n glifosaatmolekuul deur 'n kalsiumioon.

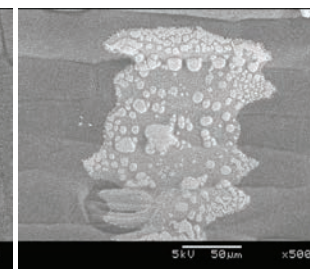
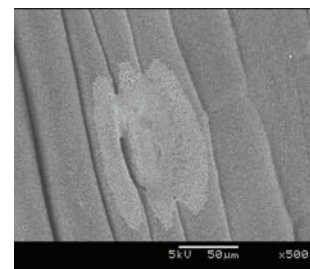


Foto 1 en 2: (1) Druppelresidu van glifosaat in lae soutinhoud-water en (2) in hardewater.

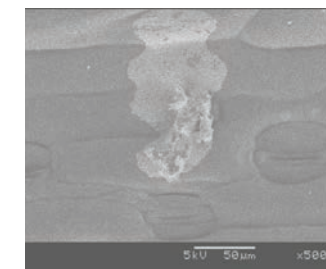


Foto 3: Druppelresidu van glifosaat in hardewater met ammoniumsulfaat.

Kommersiële produkte

Velocity-DryMax is 'n kristallyne spuitgraad-byvoegmiddel. Dit het al die voordele van ammoniumsulfaat wat hier bo beskryf is. Dit optimaliseer dus die opname en effektiwiteit van kation-sensitiewe onkruidodders in harde- en brakwater. Dit is egter nie waar die voordele van Velocity-DryMax stop nie.

Dit het ook die vermoë om die effektiwiteit van glifosaat te verbeter wanneer dit in mengsels met hormoonodders gebruik word, en dit word duidelik op die etiket aangedui. Proewe het ook bewys dat dit selfs in water met 'n lae soutlading voordelig is, dus is daar 'n positiewe invloed, selfs in die afwesigheid van antagonis-tiese katione. Dit bevat geen suur in die formu-lasie nie, dus net suiwer ammoniumsulfaat. Dit kan dus veilig in tenkengsels met produkte gebruik word waar 'n te lae pH tot fisiese onverenigbaarheid kan lei.



Slot

Harde- en brakwater het die vermoë om die effektiwiteit van glifosaat, kletodim en verskeie ander na-opkoms onkruidodders te verlaag. Ons glo dat ammoniumsulfaat nog steeds die effektiwiteit op die manier is om dit aan te spreek. Villa het twee uitstekende ammonium-sulfaat-byvoegmiddels, naamlik ons premieprodukt Class Act NG en Velocity-DryMax.

Ons beveel dit graag as 'n standaardpraktik aan met alle Villa-onkruidodders wat 'n soutbyvoegmiddel aanbeveel. Villa beveel geen ander soutbyvoegmiddels met ons onkruidodders aan nie.

Velocity-DryMax kan dus veilig as 'n standaard praktyk met kation-sensitiewe onkruidodders soos glifosaat en kletodim toegedien word.

Villa se premie-soutbyvoegmiddel is Class Act NG. Dit bevat genoeg ammoniumsulfaat om harde- en brakwater te kondisioneer, en het al die voordele van Velocity-DryMax. Dit bevat egter ook 'n benatter wat druppelafspat ver-minder en druppelverspreiding verhoog.

Hierdie suikergebaseerde benatter speel egter ook 'n aktiewe rol in die opnameproses. Verder bevat dit die gepatenteerde CornSorb-tegnologie wat 'n hoëfruktose bevochtigter insluit. Dit verleng die afdroogtyd van spuit-druppels en dus ook die opnameperiode.

Dit alles verhoog die effektiwiteit van glifosaat. As bonus bevat dit ook 'n anti-skuimprodukt, wat uitermatige skuimvorming beperk.



HOË-PROTEÏEN, GEBALANSEERDE MAALTYD VIR ALMAL

**'n GESONDE
MAALTYD**
Vinnig, maklik
en geen
voorbereiding
is nodig nie!

Alles wat jou
liggaam benodig
vanaf R3 per
maaltyd!



GENESIS bevat 3 keer
meer proteïene en
vesel, asook 13 keer
meer vitamienes as
'n standaard pap.

VS

STANDAARD PAP

6 g proteïene
1,5 g vesel
1 vitamien teen 30% NRV
1 anti-oksidant

PER 100 g PORsie

PROTEÏENE
VESEL
VOEDINGSTOWWE
ANTI-OKSIDANTE

GENESIS MAALTYD

18 g proteïene
6 g vesel
13 vitamienes teen 100% NRV
5 anti-oksidante en minerale

BESTEL AANLYN: www.genesisnutrition.co.za

of kontak vir Michelle 082 579 5517 | michelle@genesisnutrition.co.za

Unlock the full potential of foliar applications through precision pH management

Allan Huysamen,
Business Development Manager – Adjuvants, Agri Technovation



Foliar nutrition, plant growth regulator (PGR) and biostimulant applications play a crucial role in helping address nutrient deficiencies, supporting plant physiology processes in key phenological stages and enhancing overall crop performance.

The optimal performance of these sprays is extremely important to ensure that nutrients are effectively delivered to the crop at key stages and that PGR or biostimulant active ingredients can fulfil their function fully and timeously.

Optimal function of these products is not determined solely by product selection or application timing, but also by often overlooked aspects such as water quality, spray mixture properties and the ultimate spray solution pH.

While the importance of the final tank solution pH is widely recognised for its role in crop protection product (CPP) and PGR solubility, efficacy, compatibility and stability, its influence on foliar feed and biostimulant uptake and efficacy is equally significant.

This article discusses the specialised use of adjuvants to optimise foliar nutrient and biostimulant performance through extensive internal research and data-driven insights. STAY@5 (L11266) is a high-quality buffering adjuvant, including wetting agents, positioned for pH correction and stabilisation of tank mixture pH.

The correct use of STAY@5 ensures efficacy of tank mix components through ensuring ideal spray solution properties.

Why pH matters for foliar uptake

The uptake of foliar feeds, biostimulants and PGP (referred to as the foliar feed complexes/ complex in this article) through the leaf surface is governed by a combination of chemical and physiological processes.

Spray solution pH directly affects:

- The solubility and availability of foliar feed complexes in solution;
- The ionic form of elements and stability of complexes, influencing their ability to penetrate the leaf cuticle effectively;
- Penetration rate and efficiency of the foliar feed complex.

Internal research by Agri Technovation has demonstrated that the majority of foliar feeds complexes exhibit optimal uptake within specific pH ranges. Deviations from these ranges can reduce absorption efficiency, limiting the effectiveness of even the highest-quality products. While a general target pH of 5,5 remains a

reliable benchmark for most foliar applications of these products, refinement of optimal mixture properties based on mixture components and water quality unlocks the potential for ensuring maximal efficacy of each spray mixture in the programme.

The challenge of tank mix complexity

In practice, foliar feeds, biostimulants and PGP are rarely applied in isolation. Tank mixtures often include multiple products, each with its own inherent pH effect. Combined with varying water quality, this creates a complex and dynamic system that is difficult to manage using generic recommendations.

Producers are therefore faced with a key challenge: how to accurately determine the correct STAY@5 dosage when both water properties and mixture composition influence the final spray solution pH. Without precise guidance, this often leads to under-correction or application of non-ideal mixtures, potentially reducing the consistency and effectiveness of foliar applications.

From water analysis to data-driven recommendations

STAY@5 has long been supported by accurate dosage recommendations based on water quality analysis through the ITEST™WATER Spray Solution Properties service.



This approach ensures that the buffering requirement is tailored to each specific water source. Building on this foundation, a comprehensive internal database has been developed that incorporates both water properties and the pH effects of individual foliar products. This advancement makes it possible for producers to take pH management to the next level.

With a single water analysis, it is now possible to:

- Recommend target pH ranges for specific tank mixtures;
- Account for the combined pH effects of multiple foliar products;
- Provide precise STAY@5 dosage recommendations;
- Support entire seasonal spray programmes with consistent guidance.

Importantly, this approach recognises that different foliar-applied products have different optimal pH requirements. By evaluating all components of a mixture concurrently, it is possible to define a practical and effective target pH that maximises overall performance.

Case study: Improved nutrient uptake through guided pH correction

Data analysis over two consecutive years was carried out at a specific citrus farming entity across all their farms. Water sources used for foliar applications on these farms were analysed to have moderate to high alkalinity, while one particular farm had extremely high alkalinity water.

In 2024, foliar feed applications on the farms in this data set were carried out without pH correction, while in 2025, the same programme was maintained, but each spray was adjusted using STAY@5 according to our data-driven recommendations. >>

Data mining was carried out on the leaf nutrient analysis results generated at the same crop stage over these two years, during the months of February and July. The February sampling date can be seen as a baseline before nutrients such as zinc and manganese, amongst others, are applied, while the July sampling reflects leaf nutrient status at some time after these applications.

The results showed a clear and consistent improvement in leaf nutrient status in 2025,

where pH correction was implemented, with particularly strong responses observed in zinc and manganese levels. For zinc, a negative trend in the leaf Zn levels was observed in 2024 and a positive trend in 2025. For manganese, the Mn levels showed a sharp decline in 2024 and much less so in 2025.

These findings align with internal research conducted and support the conclusion that guided pH correction plays a significant role in improving nutrient uptake and overall foliar feed efficacy.

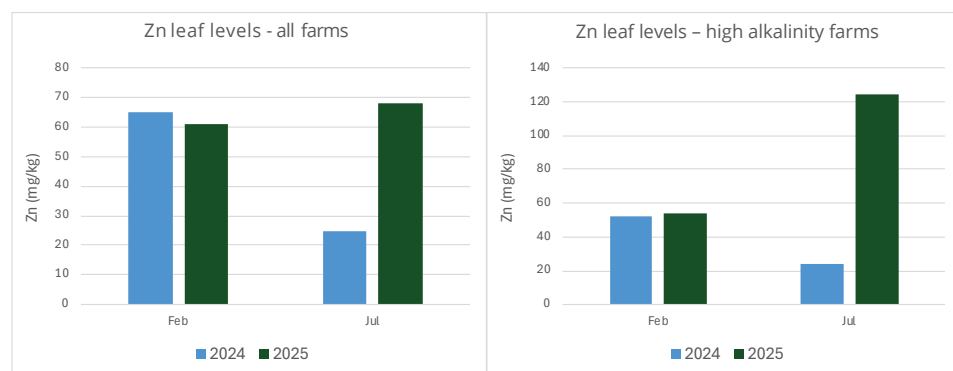


Figure 1: Leaf zinc levels in February and July months, in 2024 and 2025.

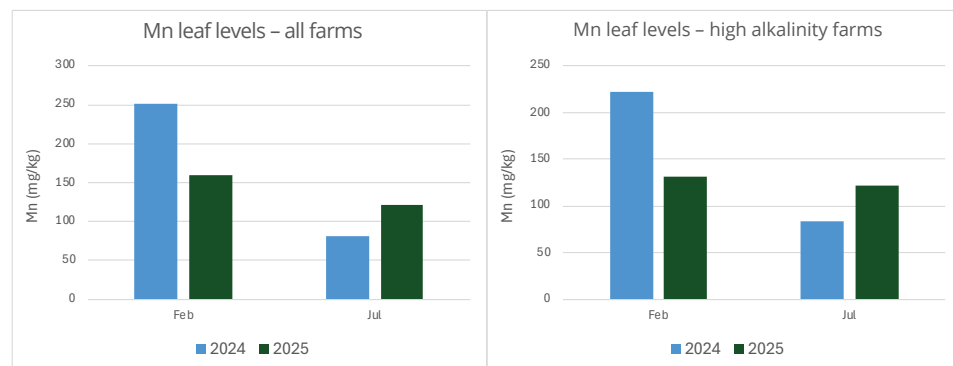


Figure 2: Leaf manganese levels in February and July months, in 2024 and 2025.



Managing variability in water quality

Water quality remains a critical variable in spray applications, particularly in regions with high alkalinity. In many cases, foliar sprays are applied without any form of pH correction, limiting their potential effectiveness.

It is also important to recognise that water quality can change over time, due to rainfall

patterns and other factors, which influence pH and buffering requirements.

Regular water analysis should therefore be carried out ideally at least twice per season where water quality fluctuation is expected throughout the spray programme, in order to maintain accurate and effective spray programmes.

Conclusion

STAY@5 continues to deliver reliable pH correction as part of a proven adjuvant offering, but its value now extends beyond buffering alone. Through the integration of water analysis, product interaction data and targeted recommendations, it enables a more precise and informed approach to foliar nutrition and biostimulant applications.

By ensuring that each spray mixture is optimised for nutrient uptake, producers can maximise the return on their foliar inputs and achieve more consistent results in the field. In an environment where margins are tight and performance matters, precision pH management becomes a key driver of profitability.

For more information, please contact Agri Technovation or your local LAC agent.

Om 'n sterk werksetiek te vestig

Myan Subrayan
LAC Cares ambassadeur



As onderwyser het ek gesien hoe baie kinders nie meer hulle beste gee nie. Nie omdat hulle nie die vermoë het nie, maar omdat inspanning stadig maar seker van waarde ontnem word. In 'n wêreld wat gevorm word deur onmiddellike bevrediging en kortpaaie, kan die waarde van harde werk maklik verouderd voel. Tog herinner die Skrif ons deurgaans dat ywer, getrouheid en volharding nie opsionele deugde is nie – dit is die fondament van 'n lewe wat God eer.

Werk vir God

“Wat julle ook al doen, doen dit van harte soos vir die Here en nie vir mense nie” (Kol. 3:23).

Hierdie vers het my bemoedig in 'n baie moeilike tyd in my lewe toe ek pas in Nieu-Seeland aangekom het. Nadat ek in die vroeë 2000's 'n suksesvolle sake-eienaar was, het ek my skielik in 'n posisie bevind waar ek vloere en toilette in 'n kitskoswinkel moes skoonmaak. Dit is toe dat Kolossense 3:23 vir my werklik geword het – om nie terug te hou nie, maar steeds my beste te gee, omdat al my werk vir God was.

'n Sterk werksetiek gaan nie oor ambisie of erkenning nie. Dit gaan oor karakter.

Dit gaan daaroor om die regte ding te doen, selfs wanneer niemand kyk nie.

Moeite is 'n keuse

In my boek, *Raising Champions*, ondersoek ek die lewens van verskeie Suid-Afrikaanse sportmense en die waardes wat hulle gevorm het. Een van die duidelikste lesse uit hierdie verhale is dat sukses nie net vir mense met buitengewone talent bedoel is nie. Dikwels behoort dit aan dié wat bereid is om ywerig, gedissiplineerd en getrou te wees in dit wat aan hulle toevertrou is.

In Chad le Clos se outobiografie rig hy hierdie woorde aan die jeug van Suid-Afrika: *“Die enigste plek waar sukses voor werk kom, is in die woordeboek.”*



Die boodskap is duidelik – talent alleen is nooit genoeg nie. Werksetiek is een van daardie eienskappe wat nie van talent afhanklik is nie, want moeite is 'n keuse.

Lesse van die plaas

Springbok CJ van der Linde, wie se verhaal in my boek verskyn, vertel dat sy begrip van harde werk nie op die sportveld begin het nie, maar op 'n plaas. As jong seun was dit nie opsioneel om voor sonsopkoms op te staan en tot sononder te werk nie – dit was bloot deel van die lewe. Daar was geen kortpaaie nie. Geen applous nie. Net moeite, volharding en verantwoordelikheid.

Daardie vroeë jare het by hom 'n onwrikbare beginsel gevestig: Harde werk is die sleutel tot sukses. Hy het dit by sy pa en oupa gesien. Of dit nou was om diere te voer, heinings reg te maak of later uitdagings in die lewe aan te pak, die les het dieselfde gebly: Jy maak klaar wat jy begin en jy gee altyd jou beste.

Kinders leer die waarde van harde werk nie deur lesings nie, maar deur te sien hoe hul ouers verantwoordelikheid, integriteit en volharding hanteer.

Waarom takies saak maak: Bou karakter tuis

Een van die mees praktiese maniere waarop ouers 'n sterk werksetiek kan vestig, is deur kinders ouderdomgepaste takies in die huis te gee. Al lyk dit eenvoudig, is die impak op karaktervorming groot.

Takies leer kinders dat hul bydrae saak maak. Hulle leer dat 'n huis nie vanself funksioneer nie, maar deur moeite, samewerking en verantwoordelikheid. Of dit nou is om hul bed op te maak, skottelgoed te was, die asblik uit te dra of jonger sibbe te help – takies kweek verantwoordelikheid eerder as eiegeregtheid.

Die Skrif bevestig hierdie beginsel duidelik

“As iemand nie wil werk nie, moet hy ook nie eet nie” (2 Tess. 3:10). Dit gaan nie oor hardheid nie, maar oor voorbereiding vir die lewe.

Takies help om die volgende te ontwikkel:

- **Verantwoordelikheid** – kinders leer dat take wat aan hulle toevertrou word, getrou voltooi moet word.
- **Dissipline** – om te doen wat gedoen moet word, selfs wanneer hulle nie lus is nie.
- **Nederigheid** – geen taak is benede hulle nie; diens bou karakter.
- **Volharding** – om klaar te maak wat hulle begin, selfs wanneer dit vervelig of herhalend is. >>



Die Skrif herinner ons deurgaans dat ywer, getrouheid en volharding nie opsionele deugde is nie – dit is die fondament van 'n lewe wat God eer.

Net soos CJ van der Linde se grootwordjare op die plaas, bevestig takies dat harde werk die pad na beloning is. Daar is waardigheid in moeite en bevrediging daarin om te weet jy het betekenisvol bygedra.

Ouers wat alle verantwoordelikheid ter wille van gemak wegneem, kan hul kinders onbedoeld van veerkragtigheid ontnem. Daarteenoor maak ouers wat deelname vereis, met liefde, konsekwentheid en genade, kinders groot wat verstaan dat die lewe inspanning verg en dat inspanning goed is.

Wanneer ouers kinders leer om te werk, berei hulle hulle nie net vir volwassenheid voor nie, maar vorm hulle harte wat aanspreeklikheid, diens en rentmeesterskap verstaan.

'n Sterk werksetiek leer kinders dat moeite saak maak, integriteit tel en volharding vrug dra. Of dit nou by die skool, in die werkplek of by die huis is – die boodskap bly dieselfde: Harde werk klop talent elke keer.

Ouers wat 'n voorbeeld van ywer stel, maak kinders groot wat voorbereid is – nie net vir sukses nie, maar vir die lewe.



Skandeer en lees
meer oor LAC Cares,
Myan se impak, en hoe om
LAC Cares te ondersteun.

www.lacares.co.za/myan-subrayan

Werksetiek is 'n dissipline

Harde werk is nie straf nie, dit is deel van dissipelskap. Dit vorm geduld, veerkragtigheid en getrouheid. Ons moet altyd ons beste gee, nie net wanneer dit ons pas of raakgesien word nie, maar elke keer.

Soos die afrigter Shaun Bartlett dit dikwels sê: *"Werk harder as jou kompetisie en sukses sal volg!"* Harde werk is geloof in aksie (Jak. 2:17). Dit is nie net sportlesse nie; dit is lewenslesse.

'n Boodskap vir gesinne vandag

Hierdie artikel is 'n herinnering aan ouers, opvoeders en jongmense: Wanneer moeite 'n gewoonte word, word uitnemendheid moontlik. In 'n kultuur wat gemak vier, roep God sy mense tot uitnemendheid.

Sunshine Leisure GROUP



The Sunshine Leisure
portfolio is a carefully
curated collection of
exceptional destinations

Contact us for
your next getaway!

Find Your Sunshine. Live Your Leisure.

www.sunshineleisure.co.za

SAAm

BOER ONS VOORUIT



Nationwide: 012 940 4398
www.laeveld.co.za
www.agritechnovation.co.za

