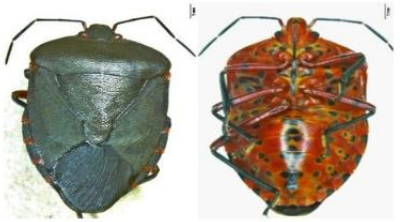
Table 1: Pests and diseases occurring on macadamias in South Africa, but not in all production regions

Scientific name (Common name)	Country of origin	Distribution (SA)	Pathway	Plant part affected	Symptoms	Photo	Reference
Boerias pavida (Boerias)	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Basicryptus costalis	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Coenomorpha nervosa (grey-brown stink bug)	ZA	MPU	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Caura rufiventris (Ndebele bug)	ZA	LIM	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022

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Scientific name (Common name)	Country of origin	Distribution (SA)	Pathway	Plant part affected	Symptoms	Photo	Reference
Anolcus campestris	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Piezodorus (small green stink bug)	ZA	MPU, LIM	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Macroraphis acuta	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Antestiopsis thunbergii (antestia bug)	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022

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Scientific name (Common name)	Country of origin	Distribution (SA)	Pathway	Plant part affected	Symptoms	Photo	Reference
Placantha lutea	ZA	MPU	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Antestia sp. (variegated stink bug)	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Carbula recurva	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Aspavia albimaculata	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022

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Scientific name (Common name)	Country of origin	Distribution (SA)	Pathway	Plant part affected	Symptoms	Photo	Reference
Tripanda signitenens	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Agnoscelis versicoloratus (sunflower seed bug)	ZA	KZN	Local: plant material/ hitchhiking/ migration	Nuts	Nut lesions, premature nut drop		Sonnekus et al., 2022
Helopeltis (tea mosquito bug)	ZA	KZN	Local: plant material/ hitchhiking/ migration International trading ports (Mozambique)	Nuts, leaves, stems	Browning of leaflets and midribs, shoot dieback, cracking of bark, orange gumming, brown/necrotic spots on nuts and through husk, discolouration of inner husk lining		Pers. comm. Andrew Sheard

Scientific name (Common name)	Country of origin	Distribution (SA)	Pathway	Plant part affected	Symptoms	Photo	Reference
Acanthococcus ironsidei (macadamia felted coccid)	AUS	MPU	Local: plant material/ hitchhiking/ migration	Nuts, leaves, stems	Leaf malformation and die-back of large portions of the trees. Dense infestations could cause flower drop, leaf die-back and subsequent reductions in nut set		Schoeman & Millar, 2018
Apamea devastator (glassy cutworm)	USA	KZN	Local: plant material/ hitchhiking/ migration	Roots, base of plant stems	Wilting, leaf curl		Pers. comm. FABI Disease Clinic

Table 2: Pests and diseases occurring on macadamias in all production regions of South Africa, but in localised areas

Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Photo	Reference
Euwallacea fornicatus (polyphagous shothole borer)	South-East Asia	Local: plant material/ hitchhiking/ migration International trading ports (wood products, wood packaging material, plants for planting of hosts, infested nuts)	Stems, branches	Sap release from trees; crystallized sugar around stem wounds, wood frass protruding from entrance holes		Paap et al., 2018
Xylosandrus crassiusculus (Asian ambrosia beetle)	Asia	Local: plant material/ hitchhiking/ migration International trading ports (wood products, wood packaging material, plants for planting of hosts, infested nuts)	Stems, branches, nuts	Sap release from trees; crystallized sugar around stem wounds, wood frass protruding from entrance holes in wood and nuts		Van den Berg, unpublished
Xyleborus ferrugineus	North America	Local: plant material/ hitchhiking/ migration International trading ports (wood products, wood packaging material, plants for planting of hosts, infested nuts)	Stems, branches, nuts	Sap release from trees; crystallized sugar around stem wounds, wood frass protruding from entrance holes in wood and nuts		Van den Berg, unpublished
Euplatypus parallelus	Central and South America	Local: plant material/ hitchhiking/ migration International trading ports (wood products, wood packaging material, plants for planting of hosts, infested nuts)	Stems, branches, nuts	Sap release from trees; crystallized sugar around stem wounds, wood frass protruding from entrance holes in wood and nuts		Van den Berg, unpublished

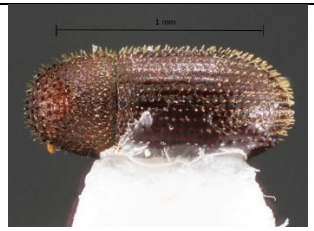
Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Photo	Reference
Carpophilus hemipterus; *C. freeman* (dried fruit beetle)	Asia	Local: plant material/ hitchhiking/ migration International trading ports (wood products, wood packaging material, plants for planting of hosts)	Stems, branches, nuts	Sap release from trees; crystallized sugar around stem wounds, wood frass protruding from entrance holes in wood and nuts		AgriOrbit, 2023; The Macadamia, 2023
Orthotospovirus sp. nov. (macadamia ringspot virus)	ZA	Local: plant material, vector movement (thrips)	Leaves	Concentric ringspots, mottling, chlorotic spots, necrosis of leaves		(Roberts *et al.*, 2024)

Table 3: Pests and diseases in South which are not known to occur on macadamia, but poses a risk

Scientific name (Common name)	Country of origin	Distribution (SA)	Pathway	Plant part affected	Symptoms	Risk reason	Photo	Reference
Ceratocystis eucalypticola	ZA	KZN	Local: plant material/ hitchhiking/ dispersal	Roots, stems	Leaf discolouration and wilting. Internal infections in the stem are visible as dark brown streaks or mottled spots in the wood	Plant pathogen of forest trees, recent host expansion to kiwi trees		Roux et al., 2020 Kvh.org.za Van Wyk et al 2012
Coryphodema tristis (cossid moth)	ZA	MPU, KZN, WC	Host expansion; esp. where in close proximity to *Eucalyptus* plantations and indigenous forests near riverine areas	Stems, branches	Trunk and branches of infested trees turn black; resin oozing on stem; sawdust in entrance holes and at the base of infested trees; extensive tunnelling of larvae in the wood; pupal casings protrude from emergence holes	Native polyphagous wood-boring moth; often expands host range. Known from *Eucalyptus*, grapevines and quince trees		Noeth et al., 2020
Spodoptera frugiperda (fall armyworm)	North and South America	Throughout South Africa	Local: plant material/ hitchhiking/ migration International trading ports (hitchhiking, imported goods, plant material)	Leaves	Foliar damage to maize characterised by ragged feeding, and moist sawdust-like droppings near the leaf whorl and upper leaves of the plant. In maize, larvae also burrow through the husk into the ear and eat the kernels.	Invasive polyphagous moth; wide host range including pecans. Especial risk where in close proximity to maize/ grain fields.		CAB International, 2019b Bright, 2024

Scientific name (Common name)	Country of origin	Distribution (SA)	Pathway	Plant part affected	Symptoms	Risk reason	Photo	Reference
Spodoptera exempta (African armyworm, black armyworm)	Through out Africa	Throughout South Africa	Local: plant material/ hitchhiking/ migration International trading ports and land border posts (hitchhiking, imported goods, plant material)	Leaves	Foliar damage to maize characterised by ragged feeding, and moist sawdust-like droppings near the leaf whorl and upper leaves of the plant. In maize, larvae also burrow through the husk into the ear and eat the kernels.	Polyphagous moth. Especial risk where in close proximity to maize/ grain fields, sugarcane and grass fields		CAB International, 2019a

Table 4: Pests and diseases that do not occur in South Africa, but pose a significant threat to macadamia production

Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Risk Reason	Photo	Reference
Halyomorpha halys (brown marmorated stink bug)	Asia	International trading ports (hitchhiking, imported goods, plant material)	Likely nuts	Feeding damage on nuts, discolouration, scabbing, necrosis	Highly polyphagous and highly dispersible. Wide distribution globally. Significant pest on other agricultural crops e.g. apples, pecan, pistachios, beans, corn, figs, grapes, peaches, pine, raspberries, soybeans, tomatoes, olives, kiwi and more		CAB International, 2013
Bathycoelia thalassina (cocoa bug)	West and Central Africa	International trading ports and land border posts (hitchhiking, imported goods, plant material)	Nuts	Necrotic lesions in nut kernels, white feeding marks, premature nut drop, deformation of nuts	Significant pest on other agricultural crops such as citrus, cocoa, mango. Phylogenetically related to *B. distincta*		Lodos, 1967
Hypothenemus obscurus (tropical nut borer)	North America	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Exit holes in husk, extensive tunnelling in husk and nut, kernel becomes mouldy	Confirmed pest of macadamia production in Hawaii and Colombia		Jones et al., 1992

Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Risk Reason	Photo	Reference
Cryptophlebia ombrodelta (macadamia coneworm)	Asia, Australia	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Exit holes, extensive tunnelling in husk and nut, premature nut fall, feeding damage to kernel	Confirmed pest of macadamia in Australia and Hawaii		Bright, 2024
Cryptophlebia illipeda (Koa seedworm)	Hawaii	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Exit holes, extensive tunnelling in husk and nut, premature nut fall, feeding damage to kernel	Confirmed pest of macadamia in Hawaii		PlantwisePlus Knowledge Bank, 2020
Gymnandrosoma aurantianum/ Ecdytolopha aurantiana (citrus fruit borer)	South America	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Exit holes, extensive tunnelling in husk and nut, premature nut fall, feeding damage to kernel	Confirmed pest of macadamia in Costa Rica		Gymnandrosoma aurantianum Blanco-Metzler, 1994

Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Risk Reason	Photo	Reference
Ectomyelois muriscis (snout moth)	Central and South America	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Exit holes, extensive tunnelling in husk and nut, premature nut fall, feeding damage to kernel	Phylogenetically related to carob moth. Confirmed pest of macadamia in Brazil.		The macadamia pests of Brazil- Leonardo Moriya
Cryptoblabes hemigypsa (macadamia flower caterpillar)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Flowers, racemes	Sap exudation from flower, browned-off flowers, destroyed buds, webbing, frass covering flowers and racemes	Confirmed pest of macadamia in Australia		Bright, 2024

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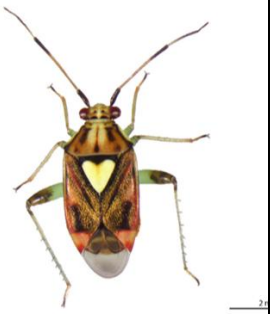
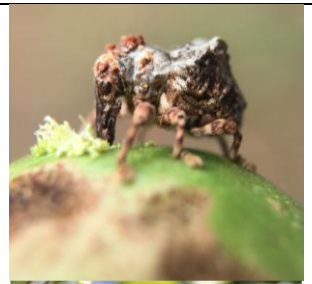
Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Risk Reason	Photo	Reference
Acrocercops chionosema (macadamia leaf miner)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Leaves	Leaf mining, blisters	Confirmed pest of macadamia in Australia	 	Bright, 2024
Amblypelta nitida (macadamia fruit spotting bug)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Premature nut drop of young nuts, sunken necrotic spots on husks, brown lesions on inside of husk and kernel	Confirmed pest of macadamia in Australia		Bright, 2024
Amblypelta lutescens (banana spotting bug)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Premature nut drop of young nuts, sunken necrotic spots on husks, brown lesions on inside of husk and kernel	Confirmed pest of macadamia in Australia		Bright, 2024

Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Risk Reason	Photo	Reference
Austropeplus annulipes (citrus blossom bug)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Flowers and racemes	Feeding damage on flower buds and racemes, complete "defoliation" of flowers	Confirmed pest of macadamia in Australia		Pers. comm. From anonymous Australian farmer
Kuschelorhyncus macadamiae (macadamia seed weevil)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Scarring and feeding damage on husk often with "golf ball" like appearance, premature nut drop, feeding damage to kernel	Confirmed pest of macadamia in Australia	 	Bright, 2024
Tiracola plagiata (banana fruit caterpillar)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Nutlets	Feeding damage on developing nuts, larvae hide under leaf litter,	Confirmed pest of macadamia in Australia	 Last instar larvae	Bright, 2024

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Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Risk Reason	Photo	Reference
Leptocoris (soapberry bugs)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Premature nut drop of young nuts, sunken necrotic spots on husks, brown lesions on inside of husk and kernel	Confirmed pest of macadamia in Australia, but opportunistic when no other hosts available		(Bright, 2024)
Assara seminivale (macadamia kernel grub)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Larvae gain access to kernel through existing wounds/ openings in husk. Consume entire kernel	Confirmed pest of macadamia in Australia	 	Bright, 2024
Cercotingis decoris (macadamia lacebug)	Australia	International trading ports (hitchhiking, imported goods, plant material)	Leaves, flowers	Sap feeding, blackened flower tips and death, nut set failure	Confirmed pest of macadamia in Australia		Bright, 2024

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Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Risk Reason	Photo	Reference
Xylorycta luteotactella (macadamia twig girdler)	Australia	International trading ports	Leaves, twigs, nuts	Webbing on leaves, ragged appearance of leaves, girdling on twigs, bunched growth, tunnelling in husks and kernels	Confirmed pest of macadamia in Australia		Bright, 2024
Lycorma delicatula (spotted lanternfly)	China/ India/ Vietnam	International trading ports- Asia, USA	Leaves, possibly nuts	Sap feeding, wilting/dieback, honeydew excretions, secondary pathogens (sooty mould), tree death	Highly polyphagous incl. several crops and other tree nuts (walnuts), highly invasive	 	Urban & Leach, 2023
Pseudocercospora macadamiae (macadamia husk spot)	Australia	International trading ports	Nuts	Pale yellow flecks with diffuse halo on the husk, spots become dark yellow/tan-brown, premature nut drop.	Confirmed disease of macadamia in Australia		Bright, 2024

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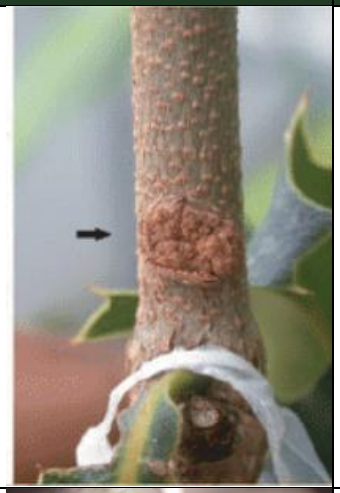
Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Risk Reason	Photo	Reference
Tubercularia lateritial Nectria pseudotrichia (macadamia stem canker)	Cosmopolitan	International trading ports	Stems, branches	Canker and callous formation on main trunk and branches, gum exudation, discolouration of plant tissue beneath canker, bark sloughing, creamy white or orange fungal structures on canker margin	Confirmed disease of macadamia in Australia		Akinsanmi and Drenth, 2006
Kretzschmaria clavus (macadamia decline)	Cosmopolitan	International trading ports	Roots, stems	Leaf discoloration, leaf drop, and branch dieback, small, mushroom-shaped lesions on the roots and basal trunks of the infected trees, marked by obvious black lines	Confirmed disease of macadamia in Hawaii	 	Ko et al., 1977; Yao et al., 2024

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