Responses of alternative annual pasture and forage legumes to challenge with infectious subterranean clover mottle virus

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KEY MESSAGES

- For SCMoV, nine new host species of alternative annual pasture or forage legumes were found: biserrula (*Biserrula pelecinus*), cupped clover (*Trifolium cherleri*), helmet clover (*T. clypeatum*), eastern star clover (*T. dasyurum*), gland clover (*T. glanduliferum*), Morrocan clover (*T. isthmocarpum*), bladder clover (*T. spumosum*), arrowleaf clover (*T. vesiculosum*) and Trigonella (*Trigonella balansae*).
- The SCMoV host status of four other alternative annual pasture species, crimson clover (*T. incarnatum),* balansa clover *(T. michelianum),* purple clover *(T. purpureum)* and Persian clover (*T. resupinatum)* was confirmed.
- The most susceptible and severely damaged alternative pasture or forage legume hosts included Trigonella, and bladder, cupped, crimson, eastern star, helmet, Morrocan, and purple clovers.
- Non-hosts among alternative pasture or forage legumes included hairy canary clover (*Dorycnium hirsutum*), sulla (*Hedysarum coronarium*), pink serradella (*Ornithopus sativus)* and yellow serradella (*O. compressus*).
- The targeting of less vulnerable genotypes and species for sowing in pastures in highest risk zones for the virus is suggested.
- The need for 'duty of care' screening for vulnerability to the virus prior to release of new varieties is emphasised.

BACKGROUND

The most economically important virus infecting subterranean clover within pastures in Australia is subterranean clover mottle virus (SCMoV) which is transmitted by trampling and grazing of stock, on mower blades, on the wheels of vehicles and through seed. SCMoV was originally discovered in 1979 in plots of subterranean clover at Karridale in south-west Australia. Subsequently, infection was shown to be common in high rainfall pastures in Western Australia, Tasmania, South Australia, New South Wales and Victoria. It was also found naturally infecting some other cultivated annual clovers, and wild annual clovers, such as cluster clover. Diseased clover plants show obvious symptoms consisting of leaf mottling, leaf distortion, decreased leaf size and plant stunting. The incidence of infection often reaches high levels within old pastures. Infection decreases herbage and seed production, diminishing feed for stock and ability of pastures to regenerate annually from seed. The virus contributes to the decline of the subterranean clover component within pastures.

Although the reactions of subterranean clover and annual medics to infection with SCMoV are known, there is incomplete information on whether infection with SCMoV might pose a threat to the productivity of pastures sown with the alternative annual pasture and forage legumes currently under evaluation for their commercial potential or already being sown commercially.

METHODS

Genotypes of different species of alternative pasture and forage legumes were inoculated with infective sap in the glasshouse, and their reactions to infection with SCMoV recorded. Samples of inoculated and tip leaves of each species were tested for SCMoV presence by RT-PCR or ELISA assays.

RESULTS

Nine new host species of alternative pasture or forage legume species were found: biserrula cv. Casbah (*Biserrula pelecinus*), cupped clover cv. Lisare (*Trifolium cherleri*), helmet clover CFD13 (*T. clypeatum*), eastern star clover 24GC39 and 42BT (*T. dasyurum*), gland clover ATC87181-2 (*T. glanduliferum*), Morrocan clover MAR14.10.1 (*T. isthmocarpum*), bladder clover 87144 and 24BP (*T. spumosum*), arrowleaf clover cv. Seelu (*T. vesiculosum*) and Trigonella SA5054 (*Trigonella balansae*). Also, the host status of four other alternative annual pasture species, crimson clover cv. Caprera (*T. incarnatum),* balansa clover cv. Paradana *(T. michelianum),* purple clover 136780 *(T. purpureum)* and Persian clover cv. Persian Prolific (*T. resupinatum),* was confirmed. Apart from biserrula and gland clover, all of these 13 species became infected systemically developing obvious symptoms.

The most susceptible and severely damaged alternative pasture or forage legume hosts included Trigonella, and the following clovers: bladder, cupped, crimson, eastern star, helmet, Morrocan, and purple. The types of symptoms that developed commonly in infected plants were initial vein clearing followed by mottle, pallor, leaf deformation, reduction in leaf size and stunting. Unusual systemic symptoms not recorded previously included necrotic spotting and/or stem streaking in helmet and eastern star clovers, necrotic line patterns in Trigonella and tip leaf curling in bladder and Morrocan clovers. No infection was detected in inoculated or tip leaves of the following alternative pasture or forage species: hairy canary clover SA1111 (*Dorycnium hirsutum*), sulla cv. Grimaldi (*Hedysarum coronarium*), pink serradella cv. Cadiz (*O. sativus)* and yellow serradella cv. Santorini (*O. compressus*).

CONCLUSIONS

Information on the reactions of pasture and forage legume species to inoculation with SCMoV helps provide an indication of the likelihood that losses might occur on their release into pastures in regions of different relative risk for this virus. Regions of south-west Australia with pastures at greatest risk of damage from SCMoV are those within the high rainfall cropping areas VH3, VH4, VH5, H4 and H5. Obviously, the greatest likelihood of damage in such districts comes from sowing any genotype of pasture or forage species identified as having high levels of vulnerability to the virus, i.e. those that become infected readily, are invaded systemically and develop severe symptoms. Examples of vulnerable genotypes identified in this study are those tested of helmet, eastern star and Morrocan clovers and Trigonella. From the standpoint of SCMoV vulnerability, such genotypes are best targeted for lower risk regions while those most appropriate to sow in pastures in high SCMoV-risk regions are ones that do not become infected systemically, like the genotypes of biserulla and gland clover we tested or non-hosts like sulla or yellow serradella.

It is important for plant improvement programs to challenge advanced selections of alternative pasture and forage legumes with SCMoV prior to release of new varieties so that vulnerable genotypes can be identified. Such genotypes should be considered for culling or targeting for sowing in lower risk regions.

KEY WORDS

pasture, forage, legumes, disease, virus, SCMoV, losses, risk

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REFERENCE

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