ECO VINEYARDS
GROWING RESILIENCE NATURALLY

FACT SHEET

FUNCTIONAL BIODIVERSITY SOLUTIONS FOR AUSTRALIAN VINEYARDS

INSIGHTS FROM ORANGE, NSW

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A selection of novel ground cover species was evaluated for vineyard use in the Wine Australia-funded project 'Functional biodiversity solutions for Australian vineyards: harnessing ground covers, vineyard surrounds and native plants to deliver key ecosystem services' Project number: CSU 1702-8 conducted by Charles Sturt University. This factsheet summarises findings for three of the most promising groundcovers; the introduced species alyssum and buckwheat, and the native species creeping boobialla.

Lobularia maritima, alyssum

Alyssum is a low-growing plant species that attained an average height of 25 cm under vineyard conditions in a recent study in New South Wales. It grew rapidly on a well-drained site, occupying approximately 30% of the area in sown under-vine plots by mid-summer; this helped suppress weed regrowth. It did not thrive on a waterlogged site. More general experience of alyssum in field trials indicates that individual plants can survive for more than one year and that seed production leads to recruitment of young plants. Accordingly, it can produce a persistent, long-term ground cover. For initial establishment, surface sowing onto moist, bare soil is best, as sunlight is required for germination.

Beneath vines, we observed its low height left plenty of open space between it and the vines, allowing more airflow than the weedy vegetation it replaced.

The weedy vegetation in New South Wales field trials averaged approximately 40 cm tall. Accordingly, alyssum is likely to increase airflow in vineyards, so is useful in reducing the risk of frost and fungal disease damage. Whilst field conditions in the trial period did not provide an opportunity to measure frost damage, benefits were apparent for reducing the incidence and severity of botrytis.

Observations regarding to botrytis bunch rot and light brown apple moth (LBAM)

On a well-drained site where alyssum grew best, botrytis incidence was halved to approximately three affected bunches per plot compared with approximately six in the control plots that had weedy ground cover. The severity of botrytis in affected bunches was also reduced from a score of 12 in the control plot down to eight in the alyssum plot.

Aside from the effect of improved airflow on the severity of botrytis, damage to bunches by insect feeding can also be important.

Accordingly, reductions in LBAM damage to bunches likely contributed to the lower levels of botrytis in the plots with alyssum.

- Alyssum ground covers beneath vine rows on the well-drained site reduced the number of bunches affected by LBAM to a mean of approximately 1.5 per plot compared with approximately five in control plots that had weedy ground cover.
- On the less well-drained site, alyssum still reduced LBAM damage to a mean of approximately two per plot compared with approximate five in the control plots.

Observations regarding parasitic wasps

These reductions can be attributed to the flowers of alyssum providing nectar that attracts and nourishes beneficials, such as parasitic wasps that subsequently attack the pests.

Evidence for this comes from laboratory experiments in which female *Trichogramma pretiosum*, parasitic wasps were caged with alyssum. The wasps lived long enough to each parasitise an average of approximately nine host insects compared with only three when they were caged with water only (and no nectar source).

It is important that any ground cover vegetation added to a vineyard does not have unanticipated negative effects, such as providing nectar for LBAM. This risk was assessed in laboratory studies and alyssum flowers were found not to increase egg laying by the moths compared with a control treatment with water and no nectar source.

Future effects of alyssum will vary according to site and year

From a practical perspective, growers need to weigh-up the time and expense involved in establishing ground cover vegetation against the types of benefits that are possible.

To suppress pest insects, it may be sufficient to plant only every tenth vine row. This is because beneficial insects such as *Trichogramma* wasps can fly, so are able to move from vine rows with a ground cover strip and easily reach other rows.

In the case of achieving suppression of LBAM, this potentially has a flow-on effect of reducing botrytis. In contrast, if a grower is more concerned with suppressing weed growth and improving airflow to address fungal disease or frost risk, establishing ground covers beneath a larger proportion of the vineyard can be expected to maximise benefit. These observations apply to all three species covered in this fact sheet.

Figure 1. Alyssum growing in the under-vine area in Orange, New South Wales [Photo: Mary Retallack].

Fagopyrum esculentum, buckwheat

Buckwheat is an exotic but commonly used crop species that grew rapidly under well-drained vineyard conditions, occupying approximately 30% of the area in sown mid-row plots by mid-summer; this helped suppress weeds. The area of ground occupied by weeds in mid-row plots of buckwheat was reduced to about 60% compared with close to 100% in the control pots in which the original vegetation was retained.

Growth habit and flowering

The height of buckwheat (typically 40 to 80 cm) precludes its use as an under-vine ground cover since it would impede airflow.

Shorter growing species, such as alyssum and creeping boobialla are better suited for under-vine use.

General experience of buckwheat in field trials indicates that the crop grows very rapidly if sown into a warm seed bed. However, it is frost tender so needs to be sown in spring after the risk of frost is reduced. The rapidity with which buckwheat flowers offsets the need for late sowing and leads to flowers being available to beneficial insects reasonably early in the summer.

The duration of flowering is extended by spontaneous self-seeding and growth of a second flush of plants later in the summer if soil moisture is sufficient. Flower availability to beneficials can also be promoted by slashing sections of the flowering crop so that fresh shoots are produced that will rapidly produce flowers.

Observations regarding to botrytis bunch rot and LBAM

- Buckwheat ground covers between vine rows reduced the number of bunches affected by LBAM to a mean of one per plot on the well-drained sites compared with approximately four in control plots that had weedy ground cover.
- On the less well-drained site, buckwheat still reduced LBAM damage to a mean of approximately two per plot compared with approximately eight in the control plots.

Observations regarding parasitic wasps

These reductions can be attributed to the flowers of buckwheat providing nectar that attracts and nourishes beneficials, such as parasitic wasps that then attack the pests.

- Evidence for this comes from laboratory experiments in which female *Trichogramma pretiosum*, parasitic wasps were caged with buckwheat where they lived long enough to each parasitise an average of approximately 23 host insects compared with only three when they were caged with water only (and no nectar source).
- Benefits to *Trichogramma carverae*, a second species of wasp were less strong but each of these females parasitised an average of approximately seven host insects.

It is important that any ground cover vegetation added to a vineyard does not have unanticipated negative effects, such as providing nectar to LBAM. This risk was assessed in laboratory studies where buckwheat flowers were found not to increase egg laying by the moths compared with a control treatment with no water and no nectar source.

Future effects of buckwheat will vary according to site and year

Buckwheat is among the most economical cover crops to establish because seed is relatively inexpensive, readily available, and emerges as a dense, vigorous sward.

It does, however, need to be resown each season unlike alternative species such as alyssum and creeping boobialla that persist from year to year.

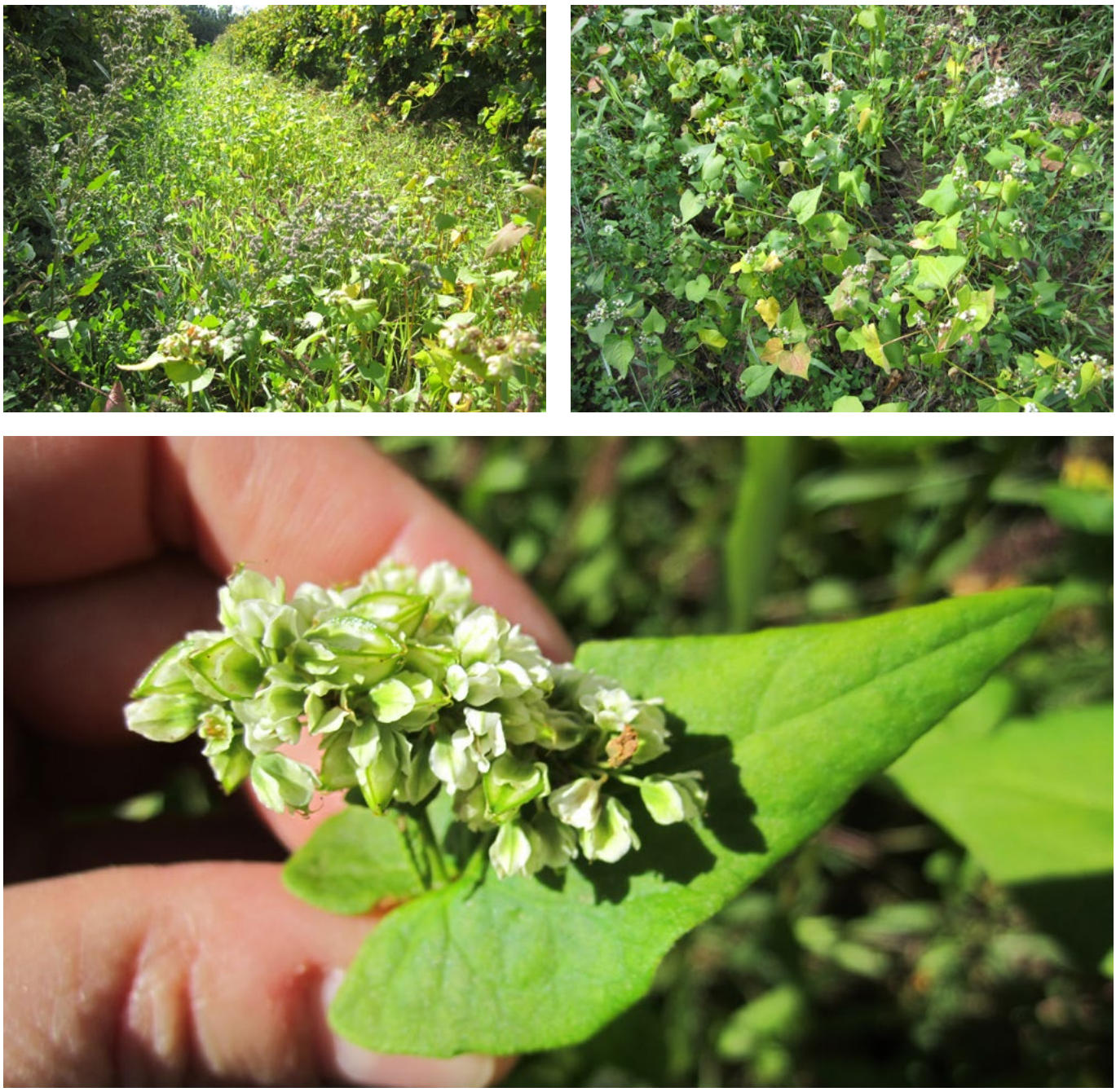

Figure 2. Buckwheat growing as a mid-row groundcover [Photos: Mary Retallack].

Myoporum parvifolium, creeping boobialla

Creeping boobialla is a low-growing native Australian plant species that attained an average height of 20 cm under vineyard conditions in Orange, New South Wales. It grew especially well under well-drained conditions but less well on a waterlogged site.

It was planted as a mixed species gound cover mix that also contained:

- *Pratia pedunculata*, matted pratia
- *Viola hederaceae*, native violet
- *Dichondra repens*, tom thumb
- *Dampiera diversifolia*, kangaroo lobelia.

These natives grew from small transplants to occupy approximately 70% of the area in under-vine plots by mid-summer. This helped suppress weed regrowth.

- On the well-drained site, competition by the sown native plant mix reduced weed coverage to less than 20% compared with over 60% in the control plots where the original spontaneous vegetation remained.
- Plots were established using small potted plants set approximately one metre apart, but this approach would be prohibitively expensive for large areas. More widely spaced plantings could be used to reduce cost and these allowed to expand coverage over subsequent years.

Growth habit

Beneath vines, the low height of creeping boobialla (about 20 cm) left plenty of open space between it and the vines, allowing more airflow than did the weedy vegetation it replaced. The weedy vegetation in the New South Wales field trials averaged approximately 40 cm tall. Accordingly, creeping boobialla is likely to increase airflow in vineyards so would be useful in reducing the risk of frost and fungal disease damage.

Observations regarding to botrytis bunch rot and LBAM

Whilst field conditions in the trial period did not provide an opportunity to measure frost damage, benefits were apparent for the reduction in incidence and severity of botrytis.

- On a well-drained site where creeping boobialla grew best, the incidence was reduced to approximately four affected bunches per plot compared with approximately six in the control plots that had weedy ground cover.
- The severity of botrytis in affected bunches also was reduced, from a score of 12 in the control plot down to six in the creeping boobialla plot.

Aside from the effect of improved airflow on the severity of botrytis, damage to bunches by insect feeding can also be important.

- Accordingly, reductions in LBAM damage to bunches are likely to have contributed to the lower levels of botrytis in plots with creeping boobialla ground covers.
- Creeping boobialla ground covers beneath vine rows on the well-drained site reduced the number of bunches affected by LBAM to a mean of approximately two per plot compared with approximately five in control plots that had weedy ground cover.

Observations regarding parasitic wasps

This reduction can be attributed to the flowers of creeping boobialla providing nectar that attracts and nourishes beneficials, such as parasitic wasps that then attack the pests.

Evidence for this comes from laboratory experiments in which female *Trichogramma pretiosum*, parasitic wasps were caged with flowering creeping boobialla shoots which lived long enough to each parasitise an average of approximately 22 host insects compared with only three when they were caged with water only (and no nectar source).

It is important that any ground cover vegetation added to a vineyard does not have unanticipated negative effects, such as providing nectar to LBAM. This risk was assessed in laboratory studies where creeping boobialla flowers were found not to increase egg laying by the moths compared with a control treatment of water and no nectar source.

Future effects of creeping boobialla will vary according to site and year.

***Myoporum parvifolium*, creeping boobialla nectar provides strong benefits to *Trichogramma* wasps, parasitoids of LBAM and its nectar did not benefit LBAM adults so can be considered one of the safest choices for use in vineyards.**

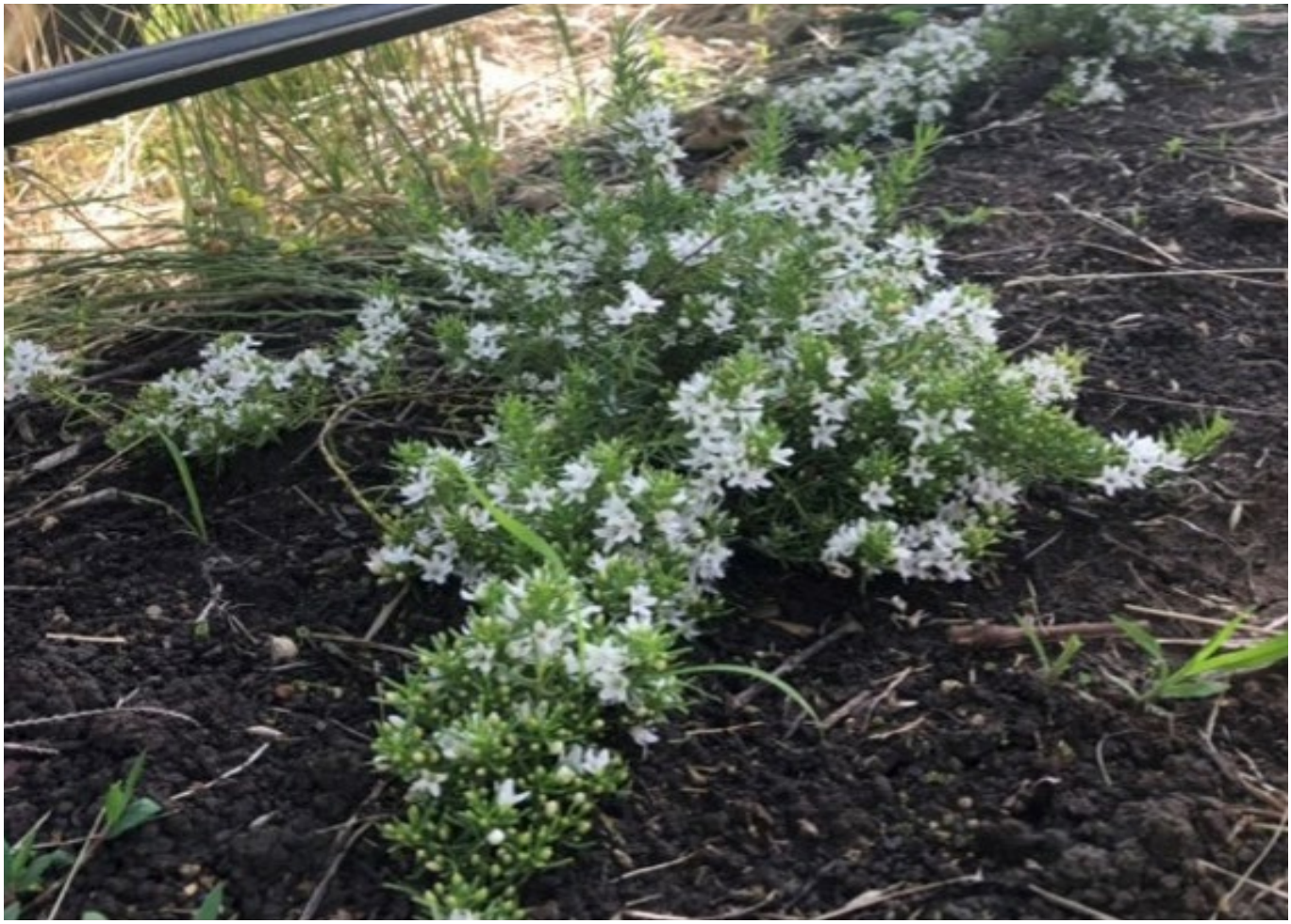

Figure 3. Creeping boobialla growing as an under-vine groundcover [Photo: Jian Liu].

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