

# Living with the Enemy

*managing lucerne seed wasp  
in lucerne seed crops*



RURAL INDUSTRIES RESEARCH  
& DEVELOPMENT CORPORATION

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by James De Barro

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#### **Researcher Contact Details**

James De Barro  
De Barro Agricultural Consulting  
PO Box 424  
KEITH SA 5267

Phone: 08 8756 2777  
Fax: 08 8756 2776  
Email: dbac@lm.net.au

#### **RIRDC Contact Details**

Rural Industries Research and Development Corporation  
Level 1, AMA House  
42 Macquarie Street  
BARTON ACT 2600  
PO Box 4776  
KINGSTON ACT 2604

Phone: 02 6272 4539  
Fax: 02 6272 5877  
Email: rirdc@rirdc.gov.au.  
Website: <http://www.rirdc.gov.au>

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## Australian lucerne seed production

The Australian lucerne seed industry produces in excess of 5,000 tonnes of seed per year of which over 90% is produced in South Australia. In Australia 85% of total lucerne seed production is produced around Keith in South Australia, encompassing more than 11,000 ha of both irrigated and dryland area. The export value of lucerne seed exceeds \$A13.5 million per annum, a value which is steadily rising in combination with growing production area. The increasing value of lucerne seed to the Australian pasture seed industry has made it a commodity requiring research and management practices to improve yields and grower returns. Being a high input crop it requires sustainable practices that are acceptable with the environmental issues impacting on primary production in today's world.

## What is a lucerne seed wasp?

Lucerne seed wasp (*Bruchophagus roddei*) is a phytophagous eurytomid wasp. The adult wasp is the size of a lucerne seed and is a shiny, jet black colour. (Figures 1 and 2)



**Figure 1:** Adult seed wasp, pupa and larva



**Figure 2:** Lucerne seed wasp and lucerne seed husk

## **What isn't a lucerne seed wasp?**

In a lucerne seed crop many small wasps and flies exist that can be confused with a lucerne seed wasp. Most small wasps are good predators of aphids and heliothis and have long tail like features (ovipostors) which the seed wasp does not have. Many small flies such as midges are common in lucerne, especially irrigated crops. These midges are the insect that is most often misidentified as seed wasps because they are the same size and shape. However, midges do not have a shiny jet black abdomen but have a dull, grey white one. The other feature that makes them distinct to the untrained eye is that the midge flies away quickly when captured whereas a seed wasp tends to curl up and “play dead”. The midge also has a bad habit of flying around people and animals on warm, humid days with the intention of getting in people’s ears, eyes and noses. The seed wasp keeps well away from people.

## **How can I catch a seed wasp?**

The easiest method is to use a sweep net. Sweep the net through the lucerne, give the net a little shake to knock the contents to the bottom and look inside. Seed wasp will be present in the net if any are in the field.

## **How is seed wasp a problem?**

Seed wasp is attracted to flowering lucerne and injects an egg (oviposits) into immature seed in young developing pods. Pods are susceptible when flat and lengthening to one quarter swollen and fully lengthened and curled. Once the seed is starting to swell it is not susceptible to oviposition by the wasp. The wasp requires a flat soft pod through which to oviposit. The wasp larva requires the duration of the seed filling period to develop into a pre-pupa and pupa by feeding on the seed contents (endosperm). Once the seed ripens the pupae hatches and the wasp chews out of the seed and pod (Figures 3,4 and 5). The wasp will stay in a pre-pupal stage in the ripened seed if it is late in the season and is induced into its winter diapause.



**Figure 3:** *Lucerne pods with exit holes*



**Figure 4:** *Destroyed lucerne seeds with wasp exit holes*



**Figure 5:** *Ripe lucerne pods with seed wasp exit holes*

Unlike *Heliothis*, the wasp does not develop populations in defined intervals such as every 3-4 weeks, which are heralded by large adult wasp invasions. Seed wasp has continuing, overlapping generations, which means that all stages of the life cycle are present at any one time, in any one area in any one paddock. A spray to kill the adult will have no effect on eggs, larvae or pupae. Pupae can hatch immediately after a spray has been applied and mate almost immediately to continue the life cycle either in the same crop or elsewhere. This is the fundamental reason why insecticide usage to control the lucerne seed wasp is a waste of time and money.

Every wasp egg injected into developing seed renders that seed dead. The wasp develops enormous populations and the additive effect of each wasp's egg laying is the cause of reduced seed yield.

The initial spring hatching of seed wasp occurs in late October resulting in significantly lower wasp population presence through November, December and early January. The dryland seed crops and the presence of feral and pasture lucerne in the area near the irrigated seed crop provides the host for population development. The wasp is most active in late January and February at the time when irrigated lucerne crops are in the most susceptible period of completing flowering and are filling seed.

### **How much loss does the wasp cause?**

Research work indicates an average of total irrigated seed loss of 67.39 kg/ha. A value of A\$3.00/kg to the producer equates to a financial loss of A\$202.16/ha. With approximately 9700 ha of irrigated seed production in the south east of South Australia which is susceptible to infestation by the seed wasp, losses to producers in the area are in the vicinity of A\$2.0 million per season. In 1999/00 a total of 4993 tonne of lucerne seed at a value of A\$3.63/kg was exported, equating to a value in excess of A\$18.2 million. From research A\$5.18 million of potential seed exports are lost due to the lucerne seed wasp.

## **How does seed wasp exist in my area?**

Whilst not a native Australian insect the seed wasp is endemic wherever lucerne is grown and permitted to produce seed. The wasp is an excellent parasite of lucerne and develops its populations in response to availability of host rather than any particular environmental cue such as temperature or daylength. However, the wasp will go into winter hibernation (diapause) in response to cues in autumn. In simple terms, the more lucerne in seed production - the more seed wasp present.

Irrigated seed crops within a 5 km radius of dryland seed crops (or significant pasture or wasteland seed producing lucerne) are infested unless they mature within four weeks of the maturity date of the dryland crop. Areas outside the 5 km radius are not significantly affected regardless of the crops maturity date - especially if the crops in this region matured at a similar time.

## **Can I eradicate seed wasp?**

Research indicates that eradication of seed wasp is not possible. Insecticide is not a means of permanent control. The wasp will always be present where lucerne is grown and the key to management is to live with the presence of the pest but make changes to management to reduce its impact on seed yield.

## **How can I manage seed wasp?**

Seed wasps develop populations where lucerne is flowering and setting seed. Sanitation practices such as mowing, grazing and herbicide spraying significantly reduce the wasp's presence in the seed crops by reducing the availability of lucerne outside the seed crop for population development. Australian lucerne seed producers can individually and in co-operation with adjacent landowners/seed producers implement simple sanitation practices on a wide scale level to reduce seed wasp populations and the damage to seed crops.

Research has shown that by reducing the presence of flowering lucerne around sheds, gardens and stock yards, fence lines, irrigation channels and check banks as well as in stock raceways, along

roadsides and in grazing pastures, seed wasp presence in seed crops is reduced (Figures 6 and 7). Best results are obtained by maintaining these sanitation efforts from the time lucerne first flowers in October through to when seed crops have finished flowering. In practice this may require a combination of grazing, spraying and mowing two or three times in a single season.



*Figures 6 & 7: Non-seed crop lucerne growing around sheds and next to irrigated seed crops*

Many seed producers close lucerne for seed production in December to have crops flowering in January and February when the warm/hot weather is optimal for pollination. However this management strategy permits maximum wasp damage. Producers need to assess their management concepts. By closing a crop 2 -4 weeks earlier than traditionally (e.g. November) permits harvest at 100% ripeness as opposed to 80-90% ripeness later in the season prior to autumnal rainfall. Seed wasp damage is reduced by earlier crop closure due to lower wasp populations being present at flowering and seed set.

The net return from a seed crop closed in the traditional December period where the combination of seed wasp damage and the crop not permitted to reach complete ripeness prior to desiccation is often the same or less than the net return from a similar standard seed crop closed earlier which reaches full ripeness and has less seed wasp damage.

In combination with alterations in crop closure timing, both sanitation and closing date operate synergistically to diminish seed wasp populations. With a sanitation and closing date management program in operation the population of seed wasp in the area will decline over a period of seasons. Seed producers need to assess the economics of management decisions that influence the susceptibility of seed crops to seed wasp damage in conjunction with net returns.

### **How can non-seed producers assist?**

The Australian pasture seed industry should encourage non-seed producing allies to assist in management of the seed wasp. Feral lucerne on roadsides and in wastelands such as vacant land blocks or council areas can be strategically managed to contribute to the reduction of seed wasp population development. Timely mowing or spraying of roadside verges along the main truck routes to seed processing plants as well as truck stops, gravel pits and other council managed areas would reduce the availability of flowering lucerne for wasps.

Offal dumping in town refuse tips should be monitored and managed by council or private owners. Currently this localised dumping cre-

ates a potential hatching site for up to 80,000 seed wasps per annum, which enhances wasp survivorship and spread of their gene pool.

Graziers with lucerne for purposes other than seed production should be encouraged to reduce the incidence of lucerne setting seed in pastures by suitable grazing strategies. This is an extension of the sanitation component of seed wasp management.

The involvement of non-seed producers in the management of the seed wasp appeals to the community involvement in assisting the local seed producing industry.

### **When can I start my management plan?**

The implementation of the management plan can be immediate. Consultation with nearby seed producers, neighbours, local advisers and council will develop the basis for a simple and on going management practice.

Seed wasp management is a simple but timely process. A key to wasp management is removing unnecessary host which otherwise only serves to increase the wasp population.

### **The future**

Research has discovered two species of wasps, *Idiomacromerus perplexus* and *Pteromalus sequester*, which are parasitic on lucerne seed wasps. Little knowledge of the biology of these wasps is known but they are worth investigating as potential biological control agents. Preliminary research could assess the feasibility and practicality of this option. Industry would need to determine if they considered that the economic impact of the seed wasp warranted further research.

### **Key concept**

The key concept in the management of the lucerne seed wasp is to concede that this pest can not be eradicated due to the scale of lucerne production (seed and pasture crops) in Australia. Industry must learn to live with its presence and accept that a degree of damage is a normal aspect of lucerne seed production and that techniques such as sanitation and crop closure timing reduce the pest's impact.

## PASTURE SEEDS R&D PROGRAM

RIRDC spends about \$300,000 a year on research with an objective of facilitating the growth of a profitable and sustainable pasture seeds industry based on a reputation for the reliable supply, domestically and internationally, of a range of pasture seeds. Each year specific strategies target identified research areas. In general these are:

- Develop export and import replacement opportunities for Australian pasture seed growers.
- Improve the technical and economic information available to suppliers and users of pasture seed.
- Improve the overall productivity and returns from producing and marketing quality Australian pasture seeds.
- Address environmental issues impacting on all facets of the pasture seeds industry.
- Improve communications within all sectors of the pasture seeds industry.
- Develop systems that support industry quality assurance and self-regulation.
- Develop programs to support and assist seed growers as they meet the challenges of a rapidly changing industry.



[www.rirdc.gov.au/programs/ps.html](http://www.rirdc.gov.au/programs/ps.html)

## PASTURE SEEDS

If you would like more details about this RIRDC R&D Program please contact the Program Manager Jeff Davis on 02 6272 4152, or the Program Assistant Merryn James on 02 6272 4205



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*The full details of this research project are presented in the RIRDC Research Report 'Evaluating and Managing Lucerne Seed Wasp in Lucerne Seed Crops' (pub no. 01/136), available from the Corporation. Phone 02 6272 4539 to order or view it on RIRDC's website [www.rirdc.gov.au](http://www.rirdc.gov.au)*